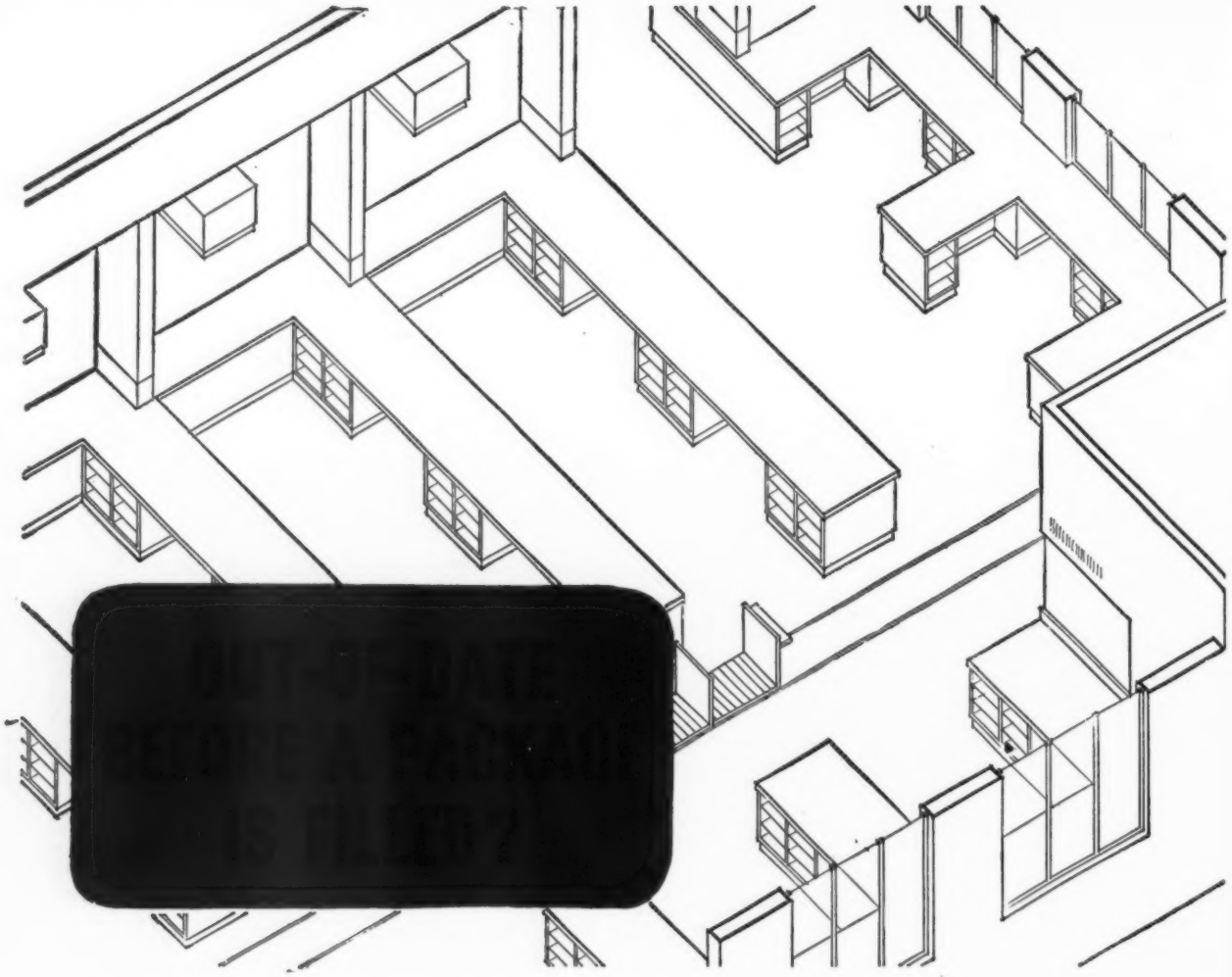
FOOD MANUFACTURE

...SARD HILL LIMITED, STRATFORD HOUSE, 9 EDEN STREET, LONDON, N.W.1 SEPTEMBER 1, 1952



WHAT'S WRONG with this fine modern food processing factory? Simply that one straightforward change in specification could put it years ahead! FORMICA working surfaces would make it truly modern. Without FORMICA, hygiene standards will be harder to achieve; maintenance and cleaning costs will be higher than they need be; renovation or renewal costs will loom up all too soon. Fit 'the surface of tomorrow' today—you'll save its first cost many times over.

HYGIENIC—A wipe with a damp cloth keeps it gleaming. Its hard, non-porous surface cannot hold dirt or germs.

TOUGH AS STEEL and hard as glass, but 'warm' to the touch. Won't chip, won't crack, won't craze.

FIRST COST IS LAST COST—No renewals, negligible maintenance. The saving in cleaners' time and materials alone is impressive.

RESISTS HEAT—Unaffected by temperatures up to 130° C. (266° F.). Cigarette-Proof grade cannot be damaged by burning cigarettes.

GOOD TO LOOK AT ALWAYS—Impervious to normal acids and alkalis, alcohol, oils, drinks and foods of all kinds. Wide range of cheerful, permanent colours and textures. Does not encourage condensation.

DE LA RUE are the sole registered users in Great Britain of the trade mark 'FORMICA'.

FORMICA REGD. MADE BY DE LA RUE

PUTS YOU YEARS AHEAD

More and more food retailers are using FORMICA—*as in this food counter at Littlewoods, Oxford Street.*

For full information about FORMICA *please write to:*

THOMAS DE LA RUE & CO. LIMITED

PLASTICS GROUP, IMPERIAL HOUSE, REGENT STREET, LONDON, W.1.

C.2328

FOOD MANUFACTURE

Vol. XXVII. No. 9 · Published Monthly · September 1, 1952

CONTENTS

	Page
Editorial	345
Biscuit Making De Luxe	349
Sir Jack Drummond	354
Lecithin in Food Processing. Part III. *Francis Aylward, Ph.D., F.R.I.C.*	355
Flour Milling	358
Danish Meat Freezing and Storing Plant. *Erik Holten, M.Sc., M.E.*	359
College of Food Technology	362
Fruit and Vegetable Utilisation in America	363
The Chemistry and Physics of Macaroni Products. Part II. *J. A. Radley, M.Sc., F.R.I.C.*	369
Trade News	375
Information and Advice	385
Recent Patents, Trade Marks, and New Companies	386

Published by Leonard Hill Limited, Stratford House, 9, Eden Street, N.W.1. Euston 5911

Subscription Rates: *1 year $6; 3 years $12; payable in advance*

GELATINES

A bright sparkling jelly can only be made from a Gelatine of good strength, clarity and colour. All our grades are tested strictly according to the methods of the British Standards Institution and standardised to a definite specification.

Our Gelatines are also submitted to the most exacting laboratory tests to ensure complete freedom from harmful impurities.

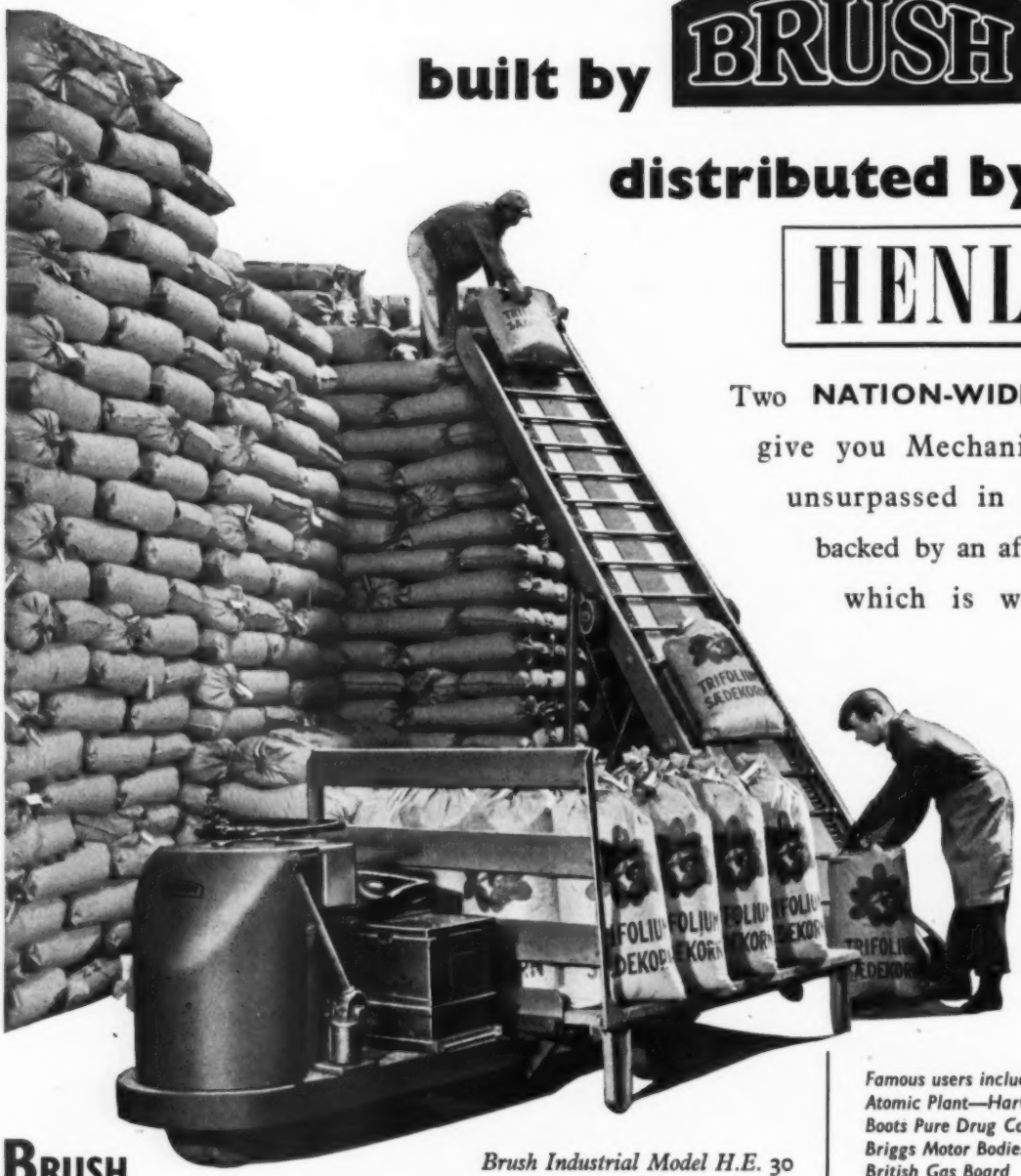
OURY, MILLAR & CO LTD.
THAMES HOUSE, QUEEN STREET PLACE, LONDON, E.C.4.

built by BRUSH

distributed by

HENLYS

Two **NATION-WIDE** organisations give you Mechanical Trucking unsurpassed in its field and backed by an after-sales service which is without equal.



Brush Industrial Model H.E. 30

BRUSH RELIABLE UNITS SPEED your HANDLING

The cheapest and largest selling trucks in their field. 10,000 Brush vehicles have proved their worth in post-war years. Battery Electric powered. Pay-loads up to 2 tons and tractors for hauling up to 5 tons.

HENLYS

England's Leading Motor Agents

COMMERCIAL VEHICLE AND INDUSTRIAL DIVISION:
Henly Hall, Osnaburgh Street, London, N.W.1. Telephone: EUSton 4273.
Manufactured by Brush Coachwork Ltd., Loughborough, England.
Tel.: 3131 Loughborough. Grams: Brushcoach, Loughborough.

Famous users include:
Atomic Plant—Harwell
Boots Pure Drug Co. Ltd.
Briggs Motor Bodies Ltd.
British Gas Board
B.I. Callender's Cables Ltd.
The British Oxygen Co. Ltd.
British Railways
British Electricity Authority
Chivers & Sons Ltd.
Courtaulds Ltd.
Eastwoods Brick Co. Ltd.
English Steel Corporation Ltd.
Ford Motor Co. Ltd.
Goodyear Tyre & Rubber Co. Ltd.
G.P.O.
G. A. Harvey & Co. Ltd.
Alfred Herbert Ltd.
Imperial Chemical Industries Ltd.
Jaguar Cars Ltd.
Johnson Matthey & Co. Ltd.
Leighton Buzzard Tile Works Ltd.
Lever Brothers Ltd.
National Coal Board
Royal Naval Armaments Depot (Hoo)
John Walker & Sons Ltd.
Timothy Whites & Taylors Ltd.

FOOD MANUFACTURE

Vol. XXVII, No. 9 September 1, 1952

Contaminated Food Dangers

AMONG the extensive and detailed items contained in the annual report of the Chief Medical Officer of the Ministry of Health, covering the period from April 1, 1950, to December 31, 1951 (H.M.S.O. Cmd. 8582), are some rather disconcerting facts about the increase in the incidence of food poisoning.

The total number of incidents reported was 3,979 and the total number of cases 7,056, but from the special reports received from medical officers of health there was evidence that more than 17,000 persons were affected. While part of the increase may be accounted for by the more complete method of reporting which was in operation for a full year for the first time, it is unlikely that all the increase could be attributed to better ascertainment.

The number of incidents reported increased by 64 per cent. over 1949, sporadic cases by 70 per cent., and outbreaks and family outbreaks by 46 per cent. Where the source of infection was ascertained nearly half the outbreaks were associated with processed, made-up, and reheated meat dishes, such as meat pies, brawn, sausages, pressed beef, reheated and cold meats, stews, gravy, and stock.

The Chief Medical Officer, Sir John Charles, observes that: "These outbreaks were due to failure to maintain an adequate standard of personal and kitchen hygiene and to faulty methods used in preparing food for large numbers. Harmful bacteria usually get into food from contaminated hands of kitchen workers and cooks. Scrupulous personal hygiene is essential for all food handlers. Every effort must be made by employers to provide wash-hand basins in kitchens and water closets, with abundant hot water, soap, nail brushes, and clean towels. Employees must be made to recognise that it is their duty to wash their hands and forearms frequently during the day's work, and that particular care is required after visits to the water closet.

"Although education in the hygiene of food preparation is now spreading owing to the efforts of medical officers of health and the catering trade, it still lags far behind what is necessary. Members of the public can speed the progress by actively insisting that their food is prepared and served with due regard to cleanliness at all stages."

That there is much to be achieved in this direction may be demonstrated by paying a visit to some eating houses and tea shops. These, we hope, are exceptions to the general rule, but it is astonishing to see the number of waitresses who serve food with dirty hands and set before the customer doubtfully clean cutlery and cracked cups. One of the minor mysteries of life still remains unsolved—why do waitresses, on putting cups on a tea table, almost invariably take hold of them with their fingers *inside* the cups?

The report also contains some interesting details about the prophylactic and therapeutic measures being taken against the common cold which is the cause of so much lost time in food and other factories.

Waste into Food

FROM time to time we have reported on the various attempts made to cultivate algae on a large scale, with a view to their use in food production. A new idea emanating from the University of California is to combine algae growth with sewage treatment, algae and sewage being fed to the same oxidation pond. The algae were found to grow well in such a medium and their regular emission of oxygen simultaneously to "treat" the sewage.

Tests have shown that the faster sewage is put through the pond, the faster grow the algae. The nutrient elements in the sewage are, of course, taken up by the algae. Quite apart from the algae cropping aspects of this scheme, the sewage is oxidised some 25 times faster than in normal oxidation pond treatment. The algae can be harvested regularly, perhaps daily, and the dried material contains up to 50 per cent. protein.

It must be doubted, however, whether sewage grown algae could ever become acceptable as human food. The drying process eliminates bacterial hazards almost entirely, and final pasteurisation would bring complete safety, but there would have to be considerable experience of near-starvation before such food, however rich in protein, could make a direct entry into a civilised diet. Its utilisation must be found in feeding animals. Land now used for growing feedingstuffs could then be released for producing crops for direct human consumption.

The possibilities are far from negligible; between 1,000 and 1,500 pounds of dried algae can be produced from a daily flow of 1,000,000 gallons of

sewage; in the San Francisco Bay area, up to 250 million gallons of sewage have to be disposed of every day. Also, the rate of food production from an algae sewage pond far exceeds anything that can be obtained from a farm crop. Soya beans are said to be the most productive farm crop known, but about 500 tons of algae can be produced from the same area that would at the most yield 30 tons of soya beans.

So far, the biggest snag in developing algae as a "crop" has been the cost of maintaining a regular supply of nutrients for a large scale culture solution. At the same time, one of civilisation's biggest wastes has long been the discard of nutrients in sewage. Now it seems possible to bring these two problems together for joint solution. The sewage farms of the future may make spectacular contributions to food production.

Eggs and the Black Market

THE black market in eggs has reached such proportions in Scotland that an estimated 75 per cent. of output is by-passing the packing stations. This estimate is based on deliveries in the period in 1950 when the black market was virtually eliminated by flush production at home, and peak imports. In 1951 stations dropped often to only 25 per cent. of that peak intake.

In the industrial areas, where black market disposal is easy, one station reports a drop of 78 per cent. Little can be done to correct this situation and secure an adequate flow through the retail trade unless the Government bases feedingstuff allocations on eggs delivered. At present the position is so uncontrolled that disregard of the regulations is the order of the day. In many cases the packing stations are losing money on shell eggs and see no solution so long as a large scale black market flourishes. Money scarcity has so far not had any effect in reducing disposals *via* this agency.

Agricultural Research

AGRICULTURAL research in private institutes of the U.S.A. is the subject of an article by K. Starr Chester, Supervisor of Research at the Batelle Memorial Institute, Columbus, Ohio, published in the August issue of *World Crops*. The private research institute serves industry by conducting research with as complete confidence as may be desired, and with the same high tempo as in industry's own laboratories, discoveries made belonging exclusively to the sponsoring industry. The institutes are, in essence, a controlled and responsive arm of the research division of each industrial concern served.

The author comments upon their phenomenal growth and describes their scope. It might be concluded, he says, that this service to industry, which is sustained by industry's profit motive, would result only in work on problems of immediate practical application. This is not the case. Work of a fundamental nature is often undertaken by the independent research institute for an industrial client. Among the principal private research institutes serving agriculture, the oldest is the Boyce Thompson Institute for Plant Research, in Yonkers, New York, where work on plant physiology and growth regulators has been especially productive. The largest is the Batelle Memorial Institute, where agricultural work is a recent development.

In the last named institute, current operating expenses are derived from current contractual research, about equally divided between industrial and Governmental sponsors. The annual operating expense in 1951 was in the vicinity of nine million dollars. Of the staff of nearly 1,700, about 60 per cent. are professional scientists working in 48 research and service divisions, each being the responsibility of a supervisor.

In the course of his article, the author gives details of the work of the research teams and the application of discoveries, and concludes with the suggestion that the success of the private research institute in the U.S.A. may have its parallel in other countries in the future.

More Synthetic Glycerine?

WHILE the recent 20 per cent. cut in glycerine supplies imposed in this country may be the result of only a temporary shortage (states *Petroleum*, July, 1952), it may also be owing to a decline in soap production caused by the increasing use of synthetic detergents. Since it is obviously unsatisfactory that this important material should be dependent for its production upon the supply and demand of another product, it is to be hoped that in the future synthetic glycerine will be able to some extent to take the place of the natural product.

During the war, glycerine was synthesised in Germany from propyl alcohol, which was dehydrated to give propylene and then subjected to a chlorination process to give the required end product. This synthetic glycerine was, however, about twice the price of the natural product, and its manufacture could therefore be justified only in war-time. In 1948, however, the Shell company started a synthetic glycerine plant at Houston, in Texas, in which the preliminary step of dehydrating propyl alcohol is avoided because ample supplies of propylene are available. This plant has a capacity of 15,000 tons of glycerine, but the chief significance is that the glycerine produced is competitive in price with the natural product.

With the expansion of the British refining industry

to a scheduled annual throughput of 23 million tons by 1953, considerable quantities of propylene will be available, thus giving an opportunity for starting synthetic glycerine manufacture in a way similar to the Shell process. Whether this step will be taken, however, depends on many factors, not least the demand for other chemicals derived from propylene, such as acetone.

A New Growth Promoting Factor

SOME interesting experimental work has recently been reported by Dr. John Yudkin on the effect of a powdered preparation of liver added to a supposedly complete stock diet (*B.M.J.*, June 28). This was given to rats and also to apparently normal children of two years of age at the average rate of 1·2 g. a day. After 13 weeks, the 32 children taking this supplement gained on average about ¼ in. more in height and 10 oz. more in weight than the 28 control children, representing gains of roughly 20 and 40 per cent.

Dr. Yudkin considers that the evidence afforded by his experiments is against the theory that the factor involved is vitamin B_{12}. The liver supplement undoubtedly contained small amounts of this vitamin, but the experiments with rats demonstrated that greater growth occurred when the liver powder was added to their diet, but not when vitamin B_{12} alone was the supplement.

The leader writer in the same issue of the *B.M.J.* raises the interesting question "whether it is desirable to feed a growth factor to children to 'make them grow': this would apply to the presumed undersized or malnourished child, or indeed to any child, to make him grow 'big and strong;' as has been suggested. It is important to keep before us the concept of growth as a form of change influenced by delicate interrelationships of many diverse factors. The change stops when it has attained its terminus of maturity, and this terminus is probably fixed. It is doubtful whether there is any evidence that causing temporary accelerations of the change from time to time therapeutically will benefit the individual or alter the form of his final maturity."

Cold Storage and Fruit Growers

SCOTTISH quick freezing and cold storage firms are receiving a fair volume of business from canners, jam makers, and food manufacturers. Supplies bought at current attractive prices are being delivered to the cold stores and held until wanted. In theory there ought to be a considerable demand for similar services from fruit growers but in practice this does not happen.

Growers appear to operate on the policy that they have already lost sufficient in losing their market, when fruit remains unsold; to spend money preserving that crop is not, from the growers' viewpoint, a logical move. It might well prove to be a worthwhile speculation were a grower to back his confidence in future markets by making such a move.

Cold storage firms in Scotland have attempted to encourage such interest but confess that there has been little or no response from fruit growers. The storing of unwanted fruit is admittedly an expensive gamble, yet the fact remains that the cold storage plants want business and have the facilities to store gluts of fruit. If only in the national interest, the possibility of co-ordination of interests deserves study.

The possibility that storage companies might themselves lay in a limited quantity speculatively to sell at periods of scarcity finds little support. The attitude of the store is that they are servicing jobbers and that the speculative holding of stock is not justified.

Canned Tuna Arrives

THE import of a million and a quarter cans of tuna from Peru and Chile by a Liverpool firm should help to fill the gap caused by the decline in red salmon deliveries which amount to only one-thirteenth of pre-war quantity.

Canned tuna is extremely popular in parts of America, although there are several kinds of fish canned under the name of "tuna" or "tunalike fish." In 1948, the total pack amounted to over seven million cases, equivalent to 48 cans to the case, each can containing 7 oz. net weight of solid meat, or 6 oz. net weight of flakes. Figures show a great preponderance of the yellowfin variety, four million cases with a value of 62 million odd dollars being produced in 1948, roughly 15·5 dollars per case. The albacore, on the other hand, with an output of 1,300,000 cases fetched on an average 19 dollars per case. According to our information, the recent shipment consists of the bonito variety (*sarda chiliensis*), the output in the U.S.A. in 1948 being 185,000 cases valued at nearly 13 dollars per case.

In Peru, this fish is called *atun*, the Spanish name for tuna. It is not permitted to be marketed as tuna in America, and the packs in cottonseed, soya bean oil, or olive oil have to be labelled "tunalike."

About 60 canning firms exist in Peru, several being active in the canning of Pacific bonito, albacore, bluefin, skipjack, and yellowfin, although the bulk of the pack consists of bonito. The same fish is also canned in large quantities in Chile. *Atun* is a popular article that figures prominently in the lists of wholesale and retail groceries in these two countries.

This canned pack has been already widely distributed and will, it is hoped, eventually lead to the replacement of a lost Liverpool industry.

Prospects for Cocoa

THE downward movement in cocoa prices which began during the summer occurred despite a drop in cocoa bean production in practically every area and in face of the certainty that the 1951-52 crop will be unusually small. According to one estimate, world output has fallen from 778,000 tons in 1950-51 to 669,000 tons in 1951-52. This is due mainly to unfavourable weather—too much rain in West Africa and too little in Brazil.

It may seem odd that prices should fall when supplies are likely to be short, but the third market influence—the willingness of ultimate consumers to buy—is exercising an even stronger effect. Money is tighter in most countries. Steady rises in the price of chocolate confectionery have produced consumer-resistance; pocket money that would previously have bought chocolate is buying ice cream, frozen lollies, and boiled sugar confectionery. In the United States cocoa stocks are already high, and further buying is likely to be cautious. There is, too, an increasing use of a so-called synthetic cocoa, based upon cheap cocoa powder and substitute vegetable fats.

If the next crop returns to something like the 1950-51 level, there will be an extra 100,000 tons or so of cocoa beans on the market, and this could easily start a severe price-tumbling movement. Reasonable price stability lies with a continued low level of production. Short-term effects are unlikely to damage the industry, but in the long run the risk is not so inconsiderable.

In West Africa the battle against swollen shoot disease is costly, cumbersome, and long drawn out. If it is waged half-heartedly the plantations may eventually be lost. Yet nothing could discourage the efforts to fight the virus more than a sharp drop in the world price of the crop. It is to be hoped that so important an asset of the Commonwealth and sterling area will not be put in greater danger because of temporary economics.

The Grain Drying Problem

A NEW and serious problem has arisen in connexion with cereals—our most important farm crop. The facilities for drying and storing grain have not kept pace with the rapid growth in the use of combine harvesters. Year by year, the margin between production on the farm and intake capacity by buyers has widened. The grain no longer waits to be threshed in the farmyard over a long season; it is threshed on the field at the time of harvesting.

The difficulties had become so marked by 1949 and 1950 that the Ministry of Agriculture set up a Working Party to examine our grain drying and storage facilities, and their Report shows that action is seriously and urgently needed. The risk of loss and damage through lack of intake facilities is high for 1952, and it must become higher for 1953 and after. Roughly, 3,000 more combine harvesters come into operation each year. No similar increases in drying plant or storage space are taking place.

The Working Party have made the obvious recommendation that facilities for drying and storage should be expanded. Preferential tax relief and an assurance as to the future of arable farming are both urged. The loss of the 40 per cent. initial allowance in the last Government's final Budget has discouraged capital expenditure on new buildings; no doubt the higher costs of capital now in force that have emerged from the present Government's first Budget also act as a disincentive.

Of the problem of our cereal grain we have been given early warning. This latest Working Party Report cannot be ignored.

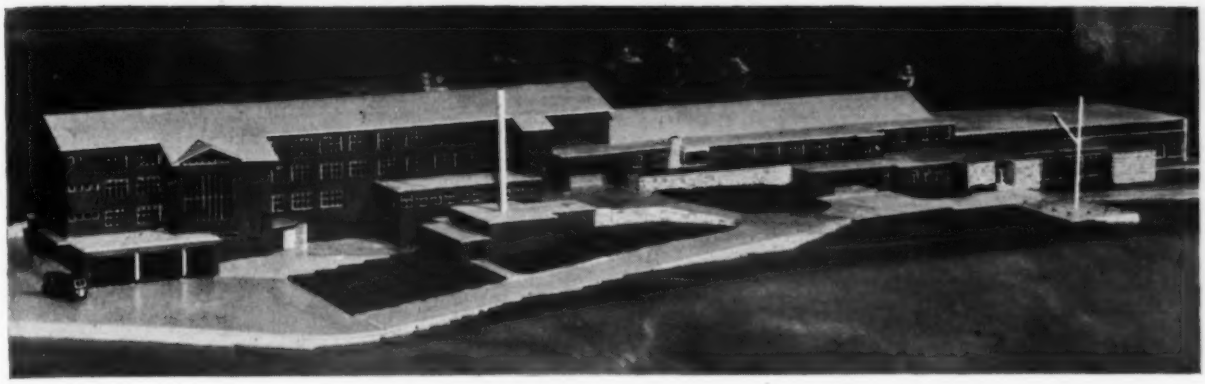
Elixir Vitae?

THERE was a time when "Venice Treacle," a concoction of 64 drugs in honey which proved "a most strong treacle," was the common antidote to every poison and a cure-all for all the maladies of mankind. In 1952 this has a rival, it seems, in crude black molasses, described in a recently published booklet as "the natural wonder food."

Rich in "most of the vitamins of the B family except B_1," and particularly rich in potassium and phosphoric acid, crude black molasses (C.B.M. for short) is not to be confused with poor plain black treacle. It is unsulphured blackstrap molasses, "preferably as thick as putty," which is the magic pick-me-up, and not the "medicated variety" sold and spoiled by chemists in trying to improve it.

"Wonder drugs" come and go, having their day and falling out of favour, says the author, so now the time has come for putting New Zealand and American C.B.M. on every dining-table as regularly as salt. White sugar conducive to rheumatism and acidity is henceforth to be on a par with white bread; for white sugar has none of the "germicide" present in C.B.M. which destroys harmful bacteria in the intestinal tract.

One teaspoonful in a cup of warm water, not gulped "but sipped and tasted like connoisseurs taste good wine," and, hey presto! gone are our growths in the bowels, our arthritis, ulcers, skin diseases, nervous disorders, high blood pressure, varicose veins, and a host of other ailments. Molasses in porridge, in marmalades and jams, or taken in milk: this is the order of the day rather than molasses for farmers' silage. Sufferers from the above complaints have had a "sticky" time in the past, but in the future molasses therapy will provide a more literal version of that descriptive term.



A model of the new factory at Cinderford.

Biscuit Making De Luxe

The most striking feature of the huge new structure erected by Meredith and Drew on the outskirts of the Forest of Dean at Cinderford relates to certain original and unorthodox methods employed during the progress of its construction. One unusual item of procedure has been that notwithstanding continuous building operations and the installation of more and more plant and equipment, production, in part, has been simultaneously carried on.

THE first impression given by the building is its size, especially its length, which allows for the installation of what are perhaps the longest baking ovens in Great Britain.

Originating from the difficulty of obtaining new plant during and after the last war, it has been, for some years, the practice of the company to design and manufacture much of the processing machinery required. This policy was largely followed in the construction of the ovens.

Design of the Building

The main entrance is centrally situated in the front of the building and is flanked on one side by the department dealing with the receipt of all raw materials, and on the other by the despatch department. Above the main entrance is the general manager's office. The obvious advantages of this arrangement are immediately discernible; the man in control is at the most central point. At Cinderford, processing operations revolve around the management office, and it is in the general office next door that the main control panel is situated.

Near at hand is the "goods inward" receiving bay, and at the time of writing this was in process of being fitted with equipment to simplify and speed up the disposal of the various types of material arriving at the factory.

Constructional Details

All main services—gas, water, and flue pipes and electrical conduits—are enclosed within the walls, panel openings being fitted for the purpose of making additions, alterations, or carrying out repairs without any danger of causing dust or dirt in the processing rooms.

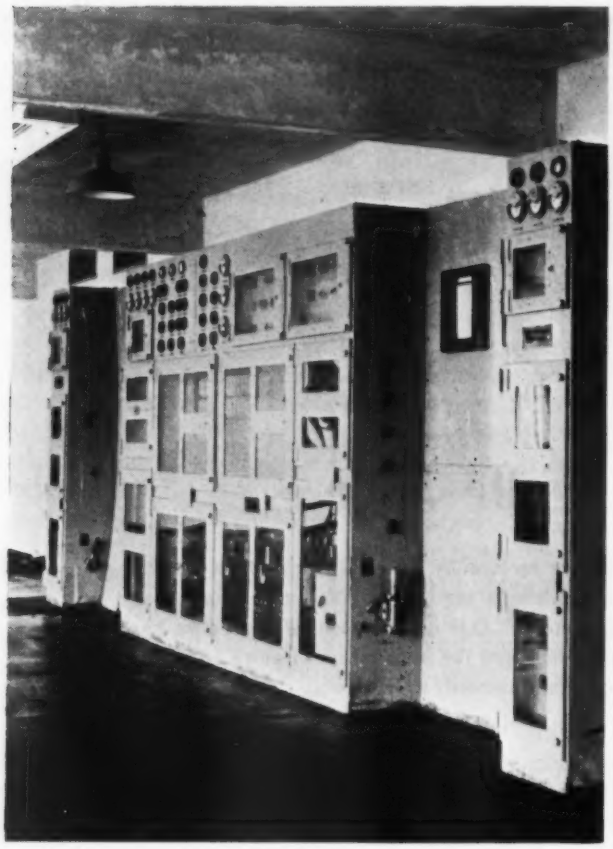
An underground passage also acts as the main duct of the air-conditioning system which covers the whole building; every six minutes there is a complete change of air throughout the processing rooms.

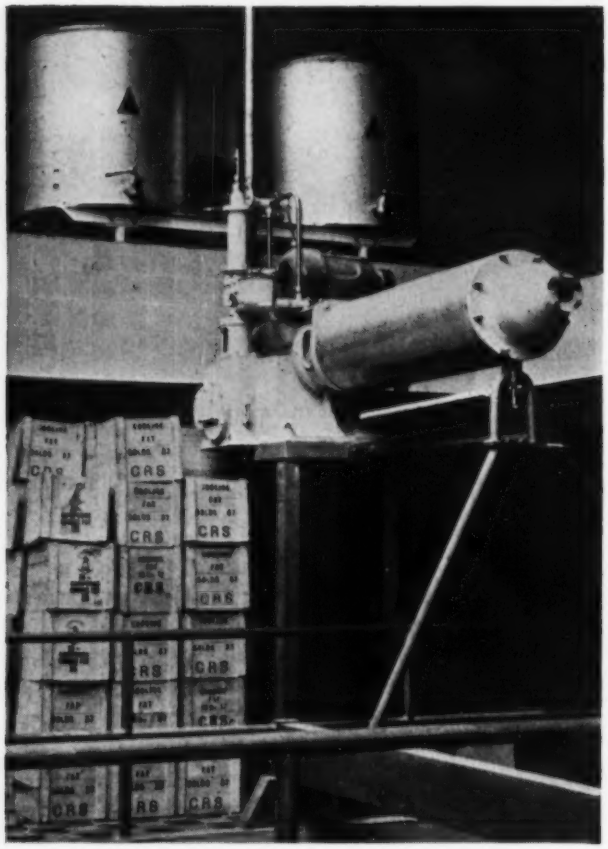
Covered recesses in the walls house brooms and other cleaning utensils and materials. This arrangement is of particular importance from the hygienic aspect, for when the building is finished all walls will present the clear surfaces much to be desired in a food factory.

False ceilings are being added to most of the processing rooms for the same hygienic purpose, and no less attention is given to the floors. Parquet flooring or quarry tiling, according to the nature of the work carried on, is the general rule, but metal tiles are used to pave parts of the flooring which have to stand heavy traffic.

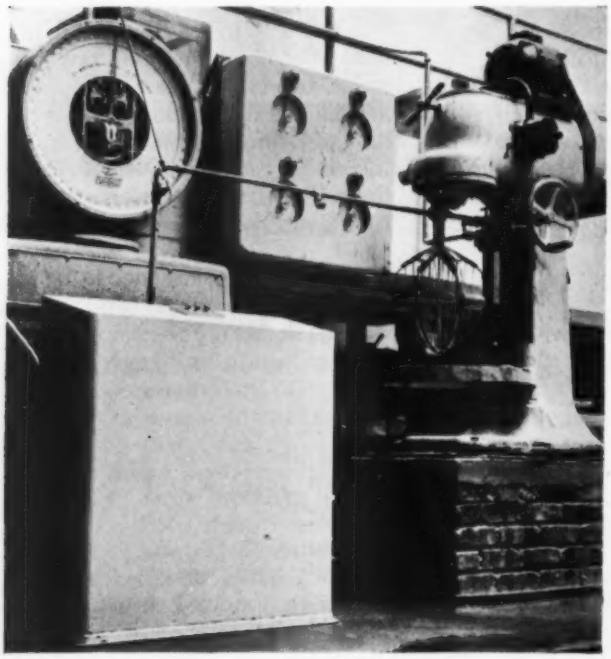
Silos are to be built for the storage of flour, the main raw material, but for the present supplies are delivered in sacks, these being unloaded on to a motorised moving belt conveyor which takes them to the raw materials store on the floor above. Fruit, cheese, yeast, etc., are dealt with in a similar way. Solid fats go to the raw materials store, and liquid vegetable fats are fed from the unloading bay to tanks below.

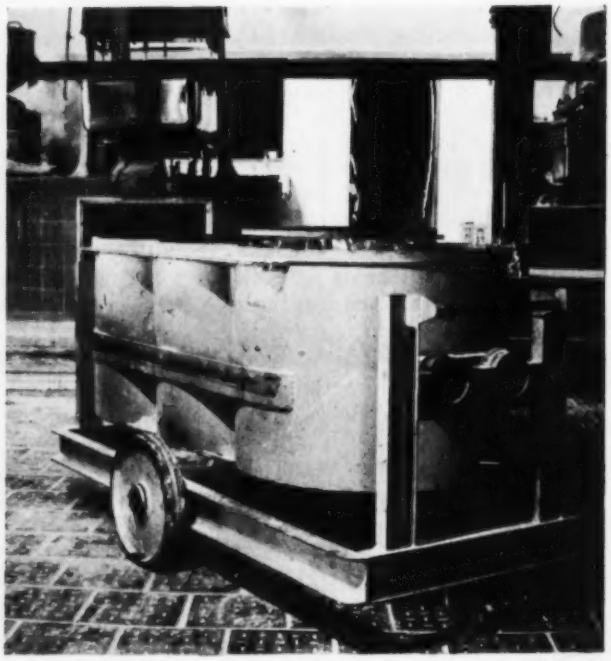
Prior to batch making, many of the ingredients require preliminary treatment—flour is sifted, hard fat shredded, and a reconstituting machine deals with milk powders, dried autolysed yeast, and other dehydrated products. Malt, glucose, syrups, and hot water are pumped from thermostatically controlled tanks. Weighed quantities are transferred to the compounding plant or to the dough tubs direct, the large weighing machine fitted with





Left: Information concerning conditions in the factory and the various stages of the processing operations is gained from the instrument panel which is situated near the general manager's office. For instance, the functioning of the automatic three-stage air-conditioning plant is registered, the working of the ovens is indicated by gas flow recorders, and the operation of the dough mixers is shown by ammeters. *Right:* Prior to batch making, many of the ingredients require preliminary treatment, after which weighed quantities are transferred to the compounding plant shown above.

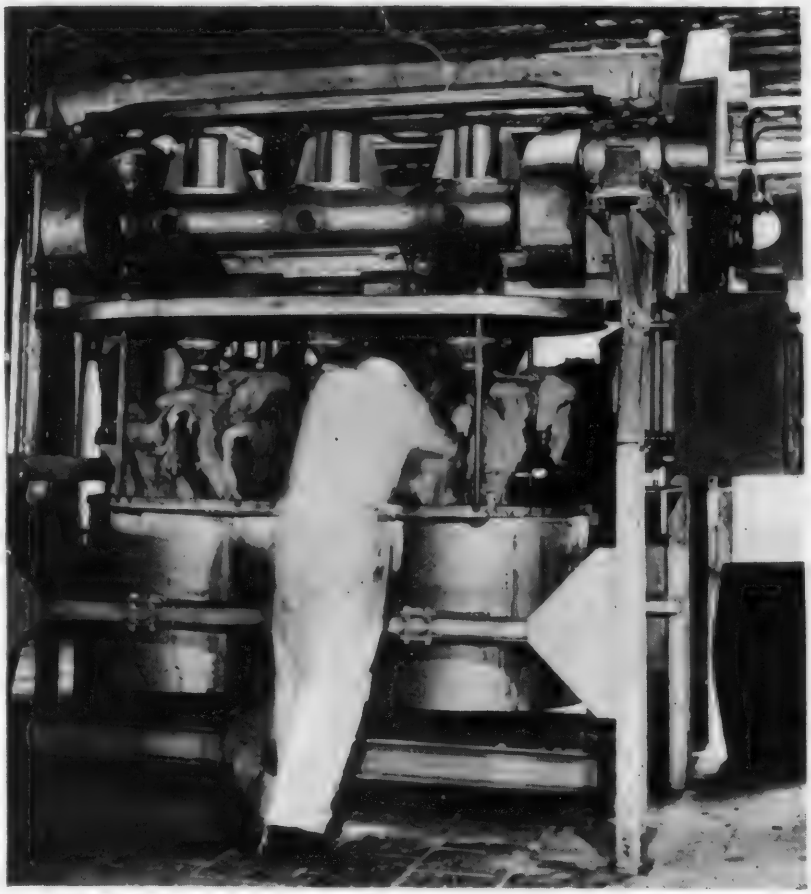




Left: The large weighing machine is fitted with stainless steel liquor scales and incorporates press button control. On the right of the weighing machine is a premixing machine which is used for such commodities as milk and egg powders. *Right:* In cases where the weighed ingredients do not pass through the compounding plant, they are fed direct to the dough tubs which are run beneath the actual mixing appliances.

stainless steel liquor scales and press button control being an interesting item of equipment.

The next step in processing is the mixing of the ingredients, and for this special machines of the company's own design are used. The mixing is done in the dough tubs themselves, these being run beneath the actual mixing appliances consisting of 3-spindle vertical drive stirrers. At present there are four sets of these machines, working in tandem. Time clocks are used to check this part of the processing.



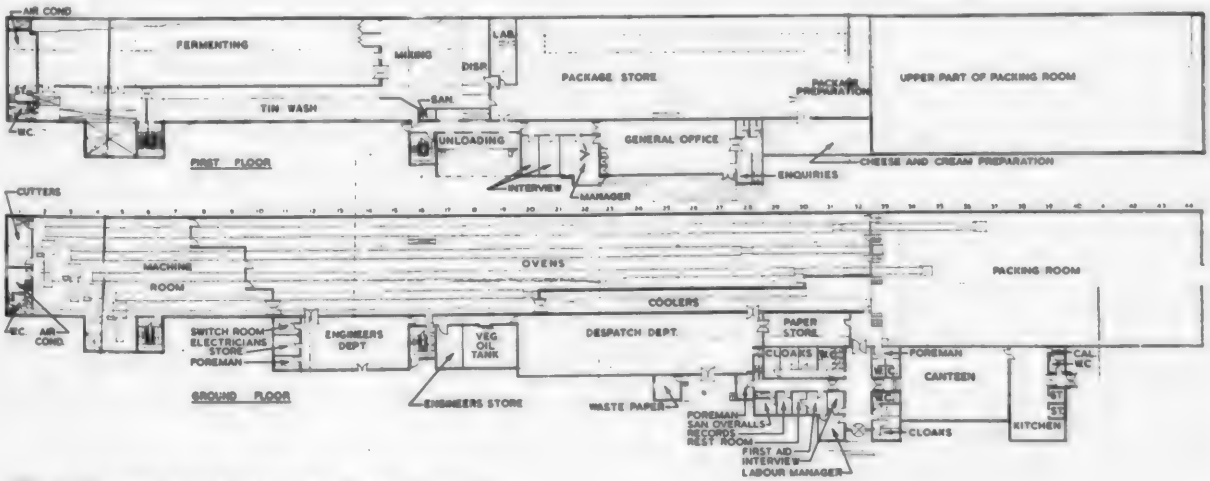
A three-spindle vertical drive mixing machine with dough tub beneath.

The Fermentation Process

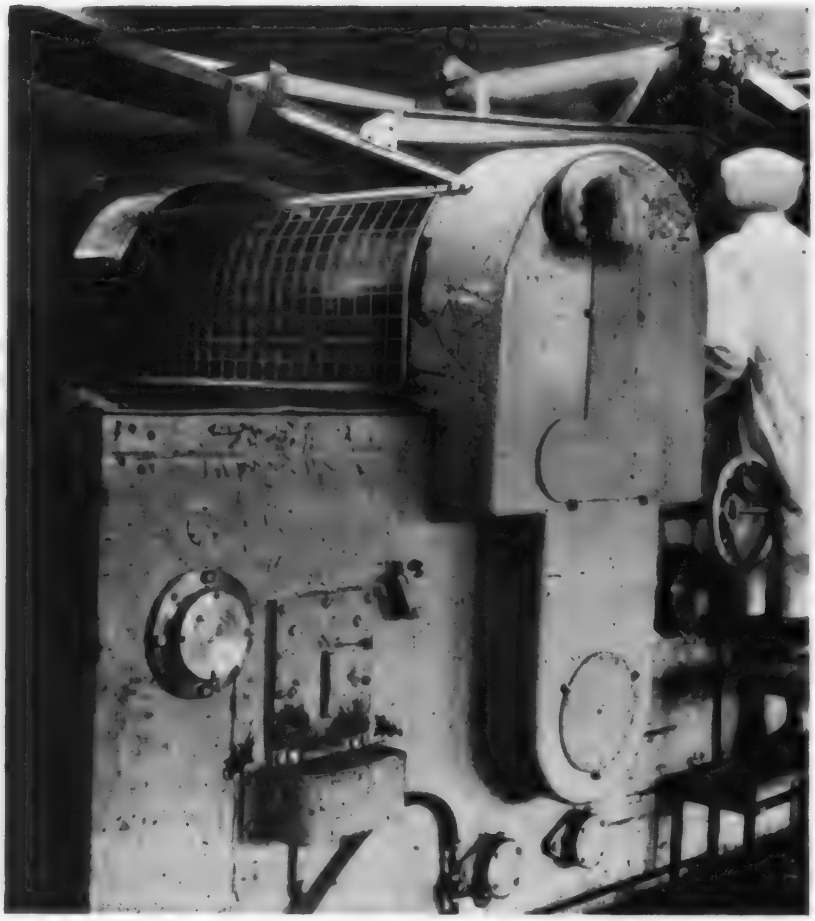
For the type of biscuit being manufactured at Cinderford, the sponge-and-dough system is used. The design and construction of the ferment room is such as to maintain constant temperature and humidity. In addition to being insulated, the outside wall, facing north, has been built without windows as a safeguard against draughts and consequent heat losses.

A two-tier system is employed for the fermenting process. First, the prepared "sponge," a mixed dough containing yeast and extra sugar, travels round the room in the dough tubs on elevated rollers, the tub carriages being temporarily removed; then more dough is added and, the carriages refitted, the tubs move round the room again at floor level. This is one part of the factory where metal tiles are fitted, because of the wear and tear that would be occasioned to other kinds of flooring. From the ferment room, which is above the biscuit machine room, the tubs are hoisted to the tipping station to enable the dough to be tipped through hoppers to the dough laying machines, which prepare it for the ovens. From this stage throughout the remaining processing, the dough is kept on a moving belt conveyor until, in the form of biscuits, it reaches the wrapping machines.

First, the dough passes through a series of reducing rollers. Then, flattened to a thin strip, it is laid in folds by a "sheeter" to produce the lightness associated with



Plan of the ground and first floors of the new factory.



The cutters used to produce the different shapes of biscuits are appliances made by the company themselves.

flaky pastry. Again the dough strip is subjected to further reducing rollers, and on the way to the cutters it passes beneath a number of fine, soft nylon brushes rigged over the conveyor track. Certain dough compositions need a dusting of flour to prevent sticking on the cutters; when necessary this is done just before the brushes are reached, and these, lowered slightly by mechanical means, distribute the flour evenly over the dough and sweep aside any surplus. Beneath the dough laying and reducing roller machines are steam pipes which are utilised in cold weather to keep the dough at the right temperature.

A complete system of telephonic communication enables overseers, machine minders, and engineers to communicate one with another along the huge length of the conveyor from the rollers, past the cutters, and thence to the ovens.

The cutters used to produce different shapes of biscuits are appliances made by Meredith and Drew themselves. Immediately after cutting, the shaped dough "biscuits," still on the conveyor belt, pass through an electromagnetic field as a safeguard against the presence of any foreign metallic fragments that might have found their way into the dough. To obviate any possibility of breakdown of the detecting device, the electrical wiring is so arranged that the starting of the conveyor is made dependent on the functioning of the electromagnets.

Baking the Biscuits

The four ovens, varying in length from 150 to 300 feet, are gas-fired, fitted with motorised extractors to remove combustion gases. These extractors ensure that all gas burners are working and the usual arrangement of periodic "spy holes" along the oven is embodied, a machine minder making continual visual inspection up and down the length of the heating section. This rather primitive system has long been considered by the company to be out of keeping with modern mechanised and automatic processing methods. Under test at the time

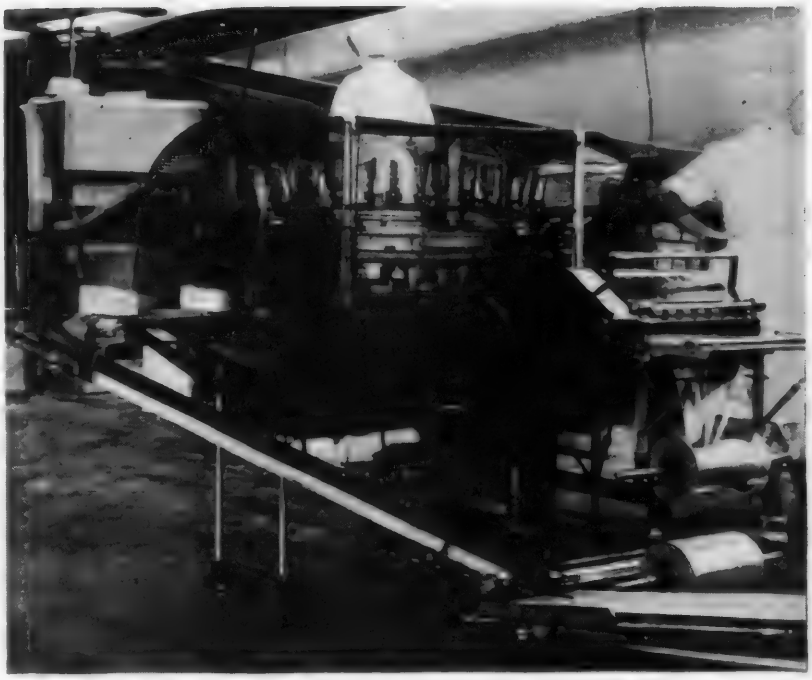
The conveyor carries the biscuits from the ovens to the packing department which is equipped with automatic wrapping, cartoning, printing, and cellulose film covering and sealing appliances.

of writing was an ingenious alternative means of inspection. One of the ovens has been fitted with a series of electrical distributors which produce a periodic but frequent spark sufficient to ignite any gas jet which for some reason is not burning.

The oven control panel is workable by either A.C. or D.C. current to overcome stoppages in processing occasioned by possible electricity cuts in the main A.C. supply. The D.C. supply is provided by the firm's own generating plant.

Among tests of the biscuit products made during processing are the weighing of samples both before and after baking to ensure that the moisture content is kept below a certain percentage, according to the type of biscuit.

From the ovens the biscuits are conveyed by moving belt to the packing department—a large lofty room situated at the extreme end of the factory and equipped with automatic wrapping, cartoning, printing, and cellulose film covering and sealing appliances. Before filling, all tins are subjected to mechanical washing with a detergent solution, rinsing, and drying.



Half-pound packets of biscuits are packed by the cellulose film wrapping machinery.

In another section of the packing department are the labelling machines for the tins which have previously been subjected to mechanical washing with a detergent solution, rinsing, and drying.

Finally, the entire control of every stage in the processing operation is exercised in the chemical and bacteriological laboratories which are situated close to the receiving bay, enabling samples of incoming goods to be tested without delay.

SOME SUPPLIERS OF EQUIPMENT

Air conditioning: *Sturtevant Engineering Co.*
Boiler: *Davey Paxman and Co.*
Tin wash machinery: *Robert Kellie and Son.*
Fat shredder: *T. and T. Vicars.*
Fat compounding machine: *Atlas Maskinfabric (Copenhagen).*
Sifters: *Locker Rotex.*
Weighing machine: *W. and T. Avery.*
Reconstituting machine for milk powder, etc.: *Read's and Barron's Mixers.*
Machine for detecting foreign bodies in dough: *Cinema-Television.*
Control panel: *Watford Electric and Manufacturing Co.*
Carton machine in which liquid latex is used for sealing: *Evershed and Vignoles.*
Apparatus for measuring moisture in biscuits: *Henry Simon.*
Heat sealer for cellulose film wrapping: *Forgrove Machinery Co.*
Labelling machine: *Farrow and Jackson.*
Time clocks: *Blick Time Recorders.*
Wall tiles: Carter and Co.
Steel tiles for floors: *Stelcon (Industrial Floors).*
Quarry tiles for floors: *Semtex.*
Wood block flooring: *Stevens and Adams.*
Asbestos: *Turners Asbestos Cement Co.*
Glass: *Pilkington Brothers.*

The baking ovens, dough mixers, dough laying, and some packing appliances have been designed by Meredith and Drew, most of them being manufactured by Steven, Smith and Co.

Sir Jack Drummond

Ministry of Food photo.

THE scientific world in general and biochemists in particular received a shock at the news of the tragedy which befell Sir Jack Drummond, D.Sc., F.R.S., F.R.I.C., and his family on August 5 while on holiday in the French Alps.

Sir Jack Drummond's career was full and fruitful. He was educated at King's College School, Queen Mary's College, and King's College, London. In 1913, he was appointed a research assistant at King's College and then joined the biochemical staff of the Research Institute of the Cancer Hospital, of which he became director in 1918. In 1922, he was appointed Professor of Biochemistry in the University of London and held the post until 1945. Since 1946 he had been director of research to Boots Pure Drug Co.

During the late war, Sir Jack Drummond acted as scientific adviser to the Ministry of Food. During his period of service at the Ministry, where his activities were multitudinous, outstanding measures of permanent benefit to the nutrition of the British people were initiated. To mention but a few there were the welfare food service for expectant mothers and infants, an extension of the milk and meals service in schools, the provision of a loaf containing a higher proportion of nutrients than its pre-war counterpart, and the fortification of margarine with vitamins A and D.

Sir Jack Drummond was chairman of the hospital catering and diet committee of King Edward's Hospital Fund and collaborated in the drafting of two memoranda on hospital diet issued by the Fund.

In 1944, he was elected to the Fellowship of the Royal Society and was knighted in the same year.

Among his many other activities, Sir Jack had been a member of the Society of Chemical Industry since 1920. He was first chairman of the Nutrition Panel of the Food Group from 1937 to 1944, and first chairman of the Fine Chemicals Group from 1948 to 1950.

The many personal tributes that have been accorded to Sir Jack Drummond are tokens of the esteem in which he was held by those who knew him, not only as an eminent man of science, but as a lovable character and an outstanding personality.

Pure Milk Supplies

A CHATTY little volume,* which will appeal to medical students studying public health, dairy workers, and others, has been written by Mr. Harry Hill, the well-known authority on pure milk supplies.

The author deals with the various sources of contamination, *e.g.* mastitis and other diseases of the cow, with the hygiene of cowsheds, methods of straining and cooling, the cleansing and sterilisation of utensils, especially milking machines, and methods for the biochemical and bacteriological examination of milk.

Mr. Hill's chief anxiety is to obtain a supply of clean milk. He recognises the difficulties involved when he emphasises that it is much easier to permit the entrance of unwanted organisms into milk than to keep them out, and calls special attention to the dangers of the entrance of organisms into the milk after production and during its subsequent handling.

Mr. Hill writes solely from the public health aspect and therefore does not deal with the financial side, but a study of his book brings home to the reader the fact that if plant and machinery is to be kept really up to date, much of it must be scrapped after a very few years of use, and that this should command an appreciable rate of income tax rebate in order to encourage the farmer.

The reviewer would like to see more stress placed on the varieties of bacteria present in milk and the relative importance of contamination. It is true that the general hygiene of the milker and the necessity for him to be free from disease is touched upon, but unfortunately there still exist milkers who go milking without a proper wash in the morning; it is this type of carelessness or ignorance which leads to the introduction of pathogenic bacteria into milk supplies.

Some authority, like Mr. Hill, should also deal firmly with the prevalent custom of leaving milk standing in cans in the sun for some hours in summer-time before being collected in uncovered lorries. Considerable space is given to the effect of changes in temperature on the rate of growth of bacteria, but in the reviewer's experience one of the chief causes of milk turning sour is its exposure for long periods at the farms prior to collection.

Many farmers are aware of this and complain that, when they happen to send sour milk to the collecting stations, they are not really to blame. The cause of much of this souring still remains to be tackled, and it would be useful if Mr. Hill dealt with these two aspects at rather greater length in the next edition of his book.—T. McL.

* *Clean Milk*. By Harry Hill. F.R.San.I., A.M.I.S.E., F.S.I.A. Pp. vii + 115. H. K. Lewis. Price 7s.

IMPORTANT ANNOUNCEMENT

THE address of Leonard Hill Ltd. is now **Stratford House, 9, Eden Street, London, N.W.1.** Telephone EUSton 5911 (10 lines).

Lecithin in Food Processing

Part III

Francis Aylward, Ph.D., F.R.I.C.
Department of Food Technology, Borough Polytechnic.

In Part II of this series a review was given of the use of lecithin supplements in breadmaking. This is now extended to include the consideration of other cereal products, such as flour confectionery, biscuits, prepared mixes, and alimentary pastes, together with cake icings, fillings, and tin-greasing agents.

MANY of the observations already made[12] in regard to the use of commercial lecithin in bread production apply with appropriate modifications to other types of cereal products. From one point of view the problem of flour confectionery production is simpler than that of bread production, in that the processes are shorter and are not dependent on the biological action of yeast with the consequent profound changes in gluten and other constituents which take place during fermentation and proving.

From another point of view, flour confectionery production is more complicated because of the wider variation of ingredients; the relatively large quantities of fats, milk, and eggs, in addition to flour; the many types of products, ranging from sponge goods with no fat except that derived from eggs to cakes containing high proportions; the considerable number of possible recipes which may, with suitable formulae balance, give products of a similar type; and finally, the different processes available.

Omitting the consideration of the relative quantities of ingredients, three main methods are used in cake production, the so-called "sugar batter," "flour batter," and "blended processes." (See Table 1.)

The Role of Fat

Whichever method is used, the resulting batters are complex systems. In addition to the fat-water phases, there is a third important component, namely, the air which is incorporated during the mixing process, and which is important in the leavening of cakes.

There is abundant evidence[13] that the fat plays an essential role in the aeration of many types of confectionery, and that there is a correlation between the degree of dispersion of the fat, the volume of air incorporated during the mixing, and the final volume of a cake. This has been demonstrated by Carlin,[18] and has been discussed in a recent paper by Fuller.[20]

The extent to which fat can take up air during the mixing process, in other words, its creaming property, is dependent on the nature and constitution of the component tri-glycerides, the degree in which these are dispersed, and other factors. One of the functions of eggs (in particular the yolk) is to aid in the dispersion of fat and in the formation of stable foams. The lecitho-proteins of the egg yolk undoubtedly make an important contribution in both these functions.

Shortenings containing Lecithin

The "blended method" of cake production came into general use in the United States, and to a lesser extent in Europe, following the introduction in 1933 of "superglycerinated" or "high ratio" fats, namely shortenings in which are incorporated mono- and di-glycerides.

Because of the presence of the emulsifying agents, these shortenings have special properties which facilitate the mixing process and enable the various ingredients, solids and liquids, to be brought together readily into a stable and uniform batter. Moreover, they enable higher ratios of sugar to flour to be used, additional moisture being necessary to ensure solution of the sugar.

Commercial lecithin has also been incorporated in shortenings with the claims that it (1) assists in the blending of the fats used in the manufacture of the shortening

TABLE 1

CAKE MAKING PROCESSES

Sugar Batter	*Flour Batter*	*Blended*
1. Creaming fat and sugar	1a. Creaming fat and part of flour 1b. Mixing of egg and sugar	1a. Mixing fat and all flour 1b. Mix liquid ingredients (egg, milk), sugar, baking powder and salt
2. Controlled addition of egg	2. Controlled addition of (1b) to (1a)	2. Addition (1b) to (1a) to give final batter
3a. For good quality product addition of flour and (if necessary) baking powder	As in Method 1	—
or		
3b. For medium quality product addition of proportion of milk, followed by blending in of flour and baking powder and then addition of remainder of milk to give final batter	As in Method 1	—

Lecithin additions in final stages, with last addition of liquid, to avoid loss of volume.

and thus gives a more homogeneous product, (2) aids in the blending of the shortening and the other flour confectionery ingredients, giving a more uniform dough or batter, (3) improves the shortening effect, giving a more tender product with better texture and keeping qualities,[22, 32] and (4) reproduces some of the other (in particular, the high ratio) effects of the superglycerinated shortenings.[25, 30, 31]

The first three of these claims are similar to those already discussed in connexion with bread, and seem likely to have general application. The fourth claim is not, however, uniformly accepted (Bailey[13]), although it has received support. Suggestions have also been made for the production of bakery shortenings containing phosphatides supplemented by other materials such as milk proteins and alginates.[19, 26, 27]

Direct Use of Lecithin

Apart from the use of manufactured shortenings containing lecithin, it may be used in flour confectionery in the form of various proprietary preparations which contain several ingredients; or in lecithinated flour; or as lecithin-water or lecithin-oil emulsions. In some cases,[18, 20] the lecithin is added by the baker to the shortenings; alternatively it is added to the batter at some appropriate stage in the process.

Following the first of these procedures, Sleigh[29] has recommended that a stock mix of one part of lecithin to seven parts of shortening should be prepared, so that 1 lb. of this mix corresponding to 2 oz. of lecithin could be used in different formulae. Writing in 1942, he advocated lecithin as "an answer to reduced shortening" in cakes as well as bread, and stated that the cakes produced showed a better structure and improved moisture retention. He suggested also that 2 per cent. lecithin in the fat would produce high ratio effects.

A number of investigators have studied the direct use of lecithin in the sugar-batter and flour-batter processes. One of the earliest suggestions made for the use of soya phosphatides in flour confectionery was as an egg yolk substitute (Rewald[28]), but it is clear that all the typical effects of egg yolk are not reproduced. Nevertheless several workers (Cook[11]) have reported favourably on the effects of lecithin, provided it is used as a supplement to other ingredients and that precautions are taken to avoid excessive amounts, and to delay the addition until full volume has been obtained. If lecithin is added too early, it will reduce the creaming effect and give a low volume of batter, which will be reflected in the final product. The quantities of lecithin required and the conditions of addition will clearly vary with the type of product being made, with the type of recipe used, and with the lecithin preparation available.

Biscuit Manufacture

The use of lecithin in biscuit making has followed the pattern described for bread. Apart from the general advantages, such as efficiency of mixing, certain special attributes are claimed for biscuit formulae in which lecithin is used, notably:

1. Dough conditioning: neutralisation of effects of strong wheat glutens.
2. Reduction of stickiness of dough.
3. More efficient use of shortening.
4. Improved colour of biscuit, especially in low fat recipes.
5. Greater stability — retardation of onset of rancidity.

The "dough conditioning" effect would appear to be of special value in the United States in view of the high protein flours available there, in contrast to the British soft flours, which have formed the basis of British processing methods leading to high quality products.

Dough Stickiness

The reduction of dough stickiness, discussed in relation to bread doughs, is of special interest to biscuit manufacturers, in that many types of biscuit formulae produce doughs which, because of their high fat and sugar content, may be difficult to process in modern high speed rotary machines. Sticky doughs result in the clogging of dies in the embossing rolls, and in the adhesion of the dough pieces to the canvas webs. It was found that with phosphatide supplements, biscuit doughs were much drier, enabling machines to be used for longer periods with less frequent stops for cleaning.

Keeping Qualities of Biscuits

An important property of biscuits is long shelf life, and many investigations have been carried out in an effort to correlate their keeping qualities with the types of fat and fat supplements used. These studies have demonstrated that the stability of fats in biscuits, and in baked goods generally, is not necessarily related to the stability of the isolated initial fat; the problem is undoubtedly complicated by the thermal and other changes which can take place during the baking process—reactions such as the destruction of antioxidants which may be present in the original shortening, especially in those of vegetable origin.

Maveerty[23] has studied the stability of biscuits made from lard with and without lecithin, and his results demonstrate that 0·15 per cent. lecithin in fat increases the shelf life considerably. Other workers[17, 21, 24] found that lecithin, although effective in retarding rancidity in shortenings, did not produce the same results in baked products. Similar anomalous results have been found with other antioxidants; with the phosphatides the explanation may lie in the complexity and variations in the commercial preparations as well as in the effects of heat on the phosphatide components which exert the antioxidant properties.

Prepared Mixes

Lecithin has found new uses in recent years as a component of the "prepared mixes" or "ready mixed flours", which have been developed in the United States on an extensive scale by milling and allied firms.

These preparations may contain all the ingredients other than liquid in the proportions required for the final product. Thus the typical mix will include flour, sugar, milk solids, shortening, an aerating agent, and minor components such as flavourings and colourings. On the addition of water (with or without milk or eggs, depending on the formulae) a batter is obtained suitable for baking into flour confectionery or biscuits.

The production of prepared mixes has been outlined in many patent specifications and in some review articles. It is evident that the presence of a suitable emulsifying agent is desirable, (1) to achieve a fine uniform dispersion of the components in the mix during its manufacture, (2) to maintain homogeneity during storage, and (3) to aid in the rapid and complete distribution of the components in the fluids added to make the batter. Many different emulsifying agents, including lecithin, have been proposed for use, and phosphatide additions, because of their antioxidant properties, may contribute to an extension of the shelf life of the mix.

Cake Icings and Fillings

Cream icings are made by creaming powdered sugar and fat with milk or water to produce an aerated emulsion of oil-in-water or water-in-oil. Hydrogenated vegetable shortenings with or without butter or flavouring agents are normally used, and emulsifying agents are commonly added to produce a more uniform and stable product. For this reason superglycerinated fats may be employed or fat containing phosphatides. Commercial lecithin may be incorporated in the fat prior to mixing this with the sugar, and it is claimed[29] that one effect of the lecithin (used to the extent ½ per cent. to 1 per cent. in the fat) is to retard the loss of moisture and thus to maintain the appearance and structure of the icing.

Because of the effect of lecithin in the lowering of the viscosity of the icing, it is probable that some economy in the use of fat may be achieved.

Tin-greasing Agents

Lecithin has also found a limited use as a component of the fat or fat-containing emulsions used in the lubrication of baking tins. It is stated that 1 per cent. or less of lecithin added to the oil or other preparation produces a more even distribution and a more economical use of the lubricant, and that it diminishes the sticking of the product to the tin during the baking process.

Alimentary Pastes

Several investigators have found that phosphatides improve macaroni products. Thus Winston and Jacobs[33] showed that small amounts of soya lecithin added to the flour promoted the formation of a dough of uniform structure which gave a paste well suited to machine treatment. Improvements have also been observed in the cooking process[15, 16] and in the final product. It is also claimed that the loss of colour (owing to the destruction of carotenoid pigments) is reduced in the presence of lecithin, because of its antioxidant action.

(To be continued)

REFERENCES

Monographs and Reviews

[12] Aylward, F. *Food Manufacture*, **27**, 285, 311. (1952.)
[13] Bailey, A. E. "Industrial Oil and Fat Products," Interscience Publishers. (1951.)
[14] Cook, L. R. *Food Industries*, **17**, 740, 900. (1945.)
[15] Stanley, J. "Soybeans and Soybean Products." (1951.)
[16] Wittcoff, H. "The Phosphatides." (1951.)

Original Papers and Patents

[17] Bohn, R. M., and Olson, R. S. *Oil and Soap*, **11**, 210, 218. (1934.)
[18] Carlin, G. T. *Cereal Chem.*, **21**, 189. (1944.)
[19] Chapin, E. K. U.S. Pat. 2,392,833. (1946.)
[20] Fuller, C. H. Chemistry and Industry, 185. (1952.)
[21] Horne, L. W., *et al. J. Am. Oil Chem. Soc.*, **25**, 314. (1948.)
[22] Jordan, S. U.S. Pat. 1,936,718. (1933.)
[23] Maveerty, D. J. *Oil and Soap*, **23**, 25. (1946.)
[24] McKinney, R. H., and Bailey, A. E. *Ibid.*, **18**, 147. (1941.)
[25] Morris, C. E. U.S. Pat. 2,125,849. (1938.)
[26] North, G. C., *et al.* U.S. Pat. 2,392,994-5. (1946.)

(Concluded at foot of next column)

[27] Markley, M. U.S. Pat. 2,494,771. (1950.)
[28] Rewald, B. U.S. Pat. 1,762,077. (1930.)
[29] Sleigh, W. K. *Bakers' Digest*, **16**, 280. (1942.)
[30] Thurman, B. H. U.S. Pat. 2,201,063. (1940.)
[31] Volaw, V. M., and Coith, H. S. U.S. Pat. 1,971,886. (1933.)
[32] Working, E. B. U.S. Pat. 1,831,728. (1931.)
[33] Winston, J. J., and Jacobs, B. R. *Food Industries*, **19**, 166. (1947.)

New Books Register

Orders for any of the books listed below, or scientific and technical books in any language, may be placed with the Books Department, FOOD MANUFACTURE, *Stratford House, 9, Eden Street, London, N.W.1. A selected stock of books is carried and may be inspected at the above address. Prices given do not include postage.*

Bowden, F. P., and Yoffe, A. D. *Initiation and Growth of Explosion in Liquids and Solids.* Cambridge University Press. Pp. 104. 93 illustrations. 22s. 6d.

Faraday, J. E. (Ed.). *Encyclopaedia of Hydrocarbon Compounds.* Vol. 11. Chemindex Ltd. Pp. 325. 110s.

Bartholomew, E. T., and Sinclair, W. B. *The Lemon Fruit: Its Composition, Physiology, and Products.* California University Press. Agents in U.K. Cambridge University Press. Pp. 164. 27 tables. 20 figures. 34s.

Flood, W. E., and West, M. *An Explaining and Pronouncing Dictionary of Scientific and Technical Words.* Longmans, Green. Pp. 397. 1,300 illustrations. 12s. 6d.

Kirk, R. E., and Othmer, D. F. (Ed.). *Encyclopaedia of Chemical Technology*, Vol. 8. Interscience. Pp. 960. £8 15s.

Maynard, L. A. *Animal Nutrition.* McGraw-Hill. Pp. 474. Illustrated. 55s. 6d.

Bonner, J., and Galston, A. W. *Principles of Plant Physiology.* Bailey Bros. Pp. 499. Illustrated. 44s.

Mitchell, H. G. *Fundamentals of Technical Electricity.* Methuen. Pp. 556. Illustrated. 18s.

Flour Milling

THE value and soundness of Lockwood's book* cannot be questioned since three editions have been called for in the past seven years and translations have been made into three languages. This book consists of three parts. In the first section the author discusses wheat in general and then proceeds to review in detail the intake, preliminary cleaning, storage, conveying, dry and wet final cleaning, and conditioning of the grain. The second section of the book deals with the milling of the cleaned and conditioned grain into flour and covers in detail all the operations involved in this process. Each of these sections runs to about 250 pages, and they are followed by a 20-page section on the administrative aspects of flour milling.

The chapters, constituting the bulk of the text, which deal with the technology of flour milling are sound and well written and they reach the standard expected from the author, who is not only a milling engineer but a practical miller of wide experience. The chapters on cognate subjects, however, are not so well presented; they show some lack of balance and need amplification.

For example, in the chapter on "Wheat Testing" no reference is made to the Alveographe, which is as reliable and informative as the Extensograph and the Extensometer for wheat testing and was used for this purpose long before the latter two instruments were devised, while in chapter XXVI not even passing mention is made of the work of British investigators which led to the discovery that Agene-treated flour causes canine hysteria and later to the isolation of the toxic factor, whereas a whole page is devoted to flour enrichment regulations which are peculiar to America.

Most of the text of the second edition remains unaltered in the third edition, the real difference between the two editions being the new matter which has been included. The chapter on "Conditioning" has been extended by a section on the Stabilisor, a new form of conditioner which was designed by the author's firm. A description of the machine and the method of operating it are preceded by a discussion on theoretical aspects of the process, and this would have been strengthened had it been possible to insert photo-micrographs in support of the claim that the value of Stabilisor treatment is due in no small measure to its causing a slight rupture between the bran and the endosperm.

The next addition to the contents of the previous edition is found in the chapter on the "Lay-out of the Mill," where new sections on three-dimensional mill planning and on industrial colour schemes have been included. Three-dimensional mill planning, which is another development of the firm of which the author is managing director, involves the use of wooden scale models of mill machinery which are set out on sheets of Perspex which in size and position bear a fixed relationship to the floors of the proposed new mill. This ingenious system has several advantages over the standard method of mill planning in which all the work is done on the drawing board.

The final section in this chapter, which deals with industrial colour schemes, is a useful and welcome addition because in the past this is a subject which has received insufficient attention from industry.

The next chapter, on the "Pneumatic Conveying of Mill Stocks," is a new one, and the author considers that this chapter alone is sufficient justification for the third edition. Considerable progress in this field has been made in recent years, and it is no exaggeration to say that it probably represents the most important development in flour milling technology since the war. This new chapter is, therefore, a valuable addition to the book, although it adds but little to the information which has already been published in articles and in technical pamphlets.

In the chapter on the "Packing, Storage, and Loading of Finished Products," several new pages have been included which discuss bulk storage of mill products and the use of paper bags for packing flour.

This book contains a wealth of information, much of which is of a practical nature. It is undoubtedly useful for the flour milling student and also is well worth a place on the bookshelf of the practical miller.—A. J. A.

* *Flour Milling*. By J. F. Lockwood. 3rd Edition. Pp. 557. The Northern Publishing Co. Price 25s. net.

A Sea-going Laboratory

THE investigations to be carried out by the Torry Research Station aboard a new vessel, designed for trawling and as a sea-going laboratory, are aimed at finding methods of reducing losses from spoilage of fish.

Extensive studies of this problem have been made at this Aberdeen research station, and recommendations have been made for bringing fish to port in the most satisfactory conditions that the present technique of icing permits. In theory, however, it is evident that the problem can only be overcome by freezing the fish at sea immediately it is caught. The new research trawler will permit, among other things, practical investigations on the fishing grounds of various aspects of this radical change in technique.

The ship, which will be equipped for trawling on a commercial scale, will have a fish-hold with a capacity of over 4,000 cu. ft. In addition there will be accommodation for the testing of fish processing plants, and a laboratory for chemical and bacteriological investigations of fish preservation and by-products.

Two auxiliary generators, each with an output of 135 kilowatts, will allow the fitting of a large scale quick freezing plant.

Danish Meat Freezing and Storing Plant

Erik Holten, M.Sc., M.E.

The building of the cold store at Esbjerg was commenced in 1948 and finished at the end of 1951, when it was ready to receive meat and other foodstuffs for freezing and storing. It is, in the proper sense of the word, a freezing plant, because, not only do the freezers occupy one full floor of the six contained in the building, but the temperatures, both in the freezers, and in the store chambers, are lower than has been the practice hitherto.

THE purpose of this freezing plant is mainly to freeze slaughtered cattle from the neighbouring export slaughterhouse, and to freeze them so that they can either be stored for a long time or withstand a lengthy period in transport, in suitably refrigerated ships, railway carriages, or motor-vans.

In this way, the slaughterhouse has been able to store a surplus of meat so as to distribute it later, when the market was better disposed to take it. The freezing plant proved its worth in the autumn of 1951 when large quantities of meat accumulated through the threat of foot-and-mouth disease at that time. Much of this meat was frozen and stored in the plant which, combined with the other cold stores in Denmark, became a price regulator, a fact much welcomed by the Danish agricultural industry.

Although the freezing plant is intended for the freezing of cattle, it will also be possible to use it for pigs, poultry, lambs, and butter.

The Building

The building is near the export quays in Esbjerg. It is close to the slaughterhouse and connected to both quay and slaughterhouse by means of closed galleries at first floor level.

The central block has six refrigerated floors, and the floor above them is destined for various auxiliaries. On the first floor, with 15 ft. free height, are three pre-cooling rooms and seven freezing rooms. The five other floors have a free height of 10 ft. 6 in. and contain the 30 store rooms for frozen meat.

The pre-cooling rooms are provided with sufficiently big air-cooling coils to enable them to serve as additional freezing rooms if necessary, and, together, the total capacity, in terms of freezing rooms, is sufficient to deal with 95 tons of meat daily, and provide storage for about a further 3,000 tons. There is a total capacity of 838,000 cu. ft. of insulated space.

Both ends of the wide central corridors are connected through air locks to ample receiving and distributing rooms in each storey, and these are vertically interconnected by four heavy lifts, two in each end of the building. Each lift has an area of 8 ft. 2½ in. × 11 ft. 6 in., and is built to take a load of 2½ tons. Receiving and loading platforms, accessible to trucks or railway cars and giving easy access to all parts, are situated on three sides of the building. As a special point of interest, it may be mentioned that the air locks on the first floor—the freezing storey—are equipped with air-conditioning devices to ensure drying of the air and to prevent (or in any case to diminish) frost formation on the doors in the central corridor.

The normal function of the plant is based on freezing half carcasses supplied from the slaughterhouse on slide rails through the closed gallery. The rails lead direct into the north-western end of the first floor of the cold store, and through the working room into the three pre-cooling rooms, where the meat is cooled to about 32°F. by means of heavy air coolers. When chilled, the carcasses hanging on the rails are pushed through the central corridor into the seven freezing rooms. These rooms are cooled by means of heavy air coolers, five rooms to be cooled to −40°F., while two other rooms can be cooled to −58°F. One of these latter rooms is destined mainly for the freezing of boned meat.

When frozen, the half carcasses are cut into quarters in the eastern corridor on the first floor. From there they are transported to other storeys either by trolleys and lifts, or by special meat lifts in the freezing block. In the store rooms temperatures can be kept down to 13°F.

In an adjacent building, but in direct connexion with the closed entrance gallery from the slaughterhouse, there is a special room for boning meat. The boned meat, after cooling to 32°F., may

The machinery house with the shell and tube condenser.

Abstracted from Sabroe News, No. 36, 1952.

In the foreground of the engine room is the three-stage group.

be frozen in one of the five freezing rooms, preferably at −58°F.

Meat arriving from other places is received, in quarters, at the platforms at the ground floor and is transported from there on trolleys to the other storeys.

Outgoing frozen meat is loaded direct on to the steamers, either through the closed gallery on the first floor in the eastern end of the building or over the ground floor platforms. At the extreme end of the gallery there is a crane intended for the loading of the steamers.

The refrigerating machinery, with workshops, transformer, etc., is placed in a special building at the south-western corner of the main building, while offices, staff room, laboratory, etc., are arranged in two smaller buildings at the north-east and north-west corners. The intensely cold store block is separated from the other buildings by means of expansion joints, from top to bottom.

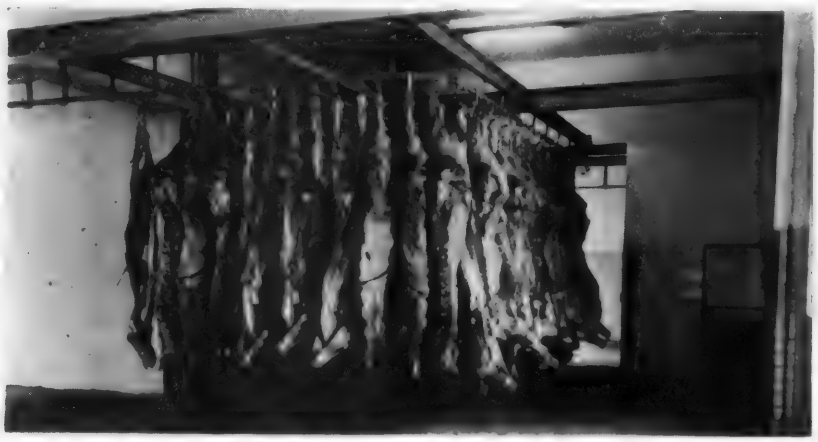
Construction of the Building

The building is constructed upon 1,700 reinforced concrete piles of 46 ft. length each. The main block and the machine house are both constructed of reinforced concrete. The intervening spaces between the columns in the machine house walls are filled in with red brickwork, while in the refrigerated main block the spaces in the external walls are filled with 3 in. cell concrete, which is completely insulated with 3 in. × 5½ in. expanded cork slabs, covered outside with asphalt and 14¼ in. red brick work.

The ceiling over the top floor of the refrigerated main block is insulated with 2 in. × 5½ in. expanded cork tiles, while the ground floor is laid with 5½ in. × 4¾ in. pieces of the same material. Thus, the refrigerated block is completely lined with cork, according to what the Americans call the "curtain wall" system; this prevents not only loss of cold but also the appearance of unsightly stains and blemishes on the outside of the brick work. The intermediate floors and some of the intermediate walls are also cork insulated.

Under the ground floor is a ventilated half cellar, by which means frost-heave of the ground is avoided.

Under the machinery hall there is a water-tight cellar for piping, etc., with heavy concrete foundation blocks to support the refrigerating machinery installed overhead.



Beef carcasses on sliding rails between the closed gallery from the export slaughterhouse (to the left) and the freezing house.

The Refrigerating Machinery

The refrigerating machinery is designed for the use of ammonia as a refrigerant, and direct expansion is adopted for cooling of stores and freezers. This system is the same as has been used in all the cold stores built in Scandinavia during the last 30 years. The special reason for choosing the direct expansion method was the low temperatures demanded there in freezers and stores, and where brine cooling was not to be recommended.

Use of Ammonia Compressors

To obtain the stipulated lowest temperatures, three groups of ammonia compressors were installed, *viz.*:

1. One one-stage, two-cylinder compressor for the pre-cooling rooms.
2. Six two-stage, four-cylinder compressors for the −40° freezers and for the −13° stores.
3. One three-stage group for the −58° freezers, consisting of three three-cylinder compressors.

The freezing capacity demanded was 50 tons of meat per day in the −40° freezers, 20 tons per day in the −58° freezers, and possibly 25 tons per day in the pre-cooling rooms, or a maximum of 95 tons per day.

Further, it was required that the plant should be of ample capacity, and that spare units should be erected to ensure safe and continuous working. In addition to this, the aforementioned plant is specially intended for freezing, and it will be understood that the capacities of the compressors, etc., selected are ample in comparison with many of the cold stores on the Continent and in Great Britain.

The compressors are all of Sabroe's type SA, with water-cooled cylinders, driven by means of V-belts from slip-ring motors. The compressors in group 2 and 3 have identical cylinder dimensions, and are of such design that they can work both in one-stage and in two-stage; furthermore, two of them are connected in such a way that one cylinder is a spare for the compressor in group 1. All the compressors are cross-connected in such a way that it is possible for either compressor to work on either group of freezers or refrigerated chambers.

The total capacity of the compressors is about 4,000,000 calories per hour (about 1,330 tons refrigeration capacity) measured at 14°F. evaporating temperature, 77°F. in the condensor, and 59°F. before the regulating valve and when working in one-stage.

Condensing Units

The condenser consists of six vertical, open-type shell and tube units, erected outside the building and connected to a common receiver in the machinery room.

Store room with frozen beef carcasses.

Condensing water is drawn from the harbour through two 12 in. reinforced concrete pipes, about 395 ft. long, and is pumped over the condensers by means of four 4 in. centrifugal pumps, of which one is held in reserve. Two special automatic self-sucking pumps are erected to secure the constant filling of the suction lines.

Through the water jackets on the compressor cylinders, which have to be cooled, water is circulated from a closed system, passing through a coil in the bottom of the condenser tray whereby the presence of stone and dirt in the water jackets is prevented, and whereby excessive consumption of the expensively obtained water from the waterworks is avoided.

A view of the closed gallery.

All the ammonia piping from the machinery room is installed in the cellar under the floor, and in such a way that no horizontal pipes are seen in this room.

On the walls in the machinery room are placed intermediate coolers, special oil chillers, distributing headers, and universal selector valves for the ammonia suction connexions from which pipes are led through the cellar and through the two pipe shafts to the various air coolers.

All compartments are refrigerated by means of air coolers with cross-blown float valve regulated coils of 1¼ in. steel pipes. Each cooler is provided with a liquid separator.

In the pre-cooling rooms and freezers on the first floor, the air coolers are placed away from the doors leading to the central corridors, and heavy streamlined propeller fans are placed under the real ceiling and over a false ceiling to within about 2 ft. 6 in. from the doors. The air is drawn from the air coolers and blown lengthwise over the false ceiling down to the other end of the room. Fans are hand-reversible.

In the storage rooms on the other floors, the air is distributed through holes in panels along the side walls, thus cross-traversing the rooms from side to side.

The air cooler coils are defrosted by means of hot ammonia, and, for the removal of frost, corridors are arranged behind the air coolers with special access and in such a way that the frost may be removed without personnel having to enter the chambers proper.

The frost which is removed from the coils is precipitated through special shafts adjoining the two pipe shafts at each side of the building. There it is melted and the water is led to the waste-water pipe.

An electrical distance thermometer installation is provided, with thermometers in each refrigerated room and with two 36 points indicators with selector controls placed in the machine room on a panel, together with control lamps for all motors working in the plant, as well as watt-meters for the bigger motors.

The entire plant building and refrigerating machinery is built under Lloyd's survey to obtain the notation +R.M.C. (in red) in the register book.

The insulation of the building is considerably more effective than required by Lloyd's, as the temperature rise in the rooms during cessation of the machinery was only about 0·33°F. on an average with −22°F. in the store rooms, −49°F. and −58°F. in the freezing rooms and with an outside average temperature of 60°F.

Danish agriculturists should be proud of this solidly built and well insulated freezing plant, which will be a worthy landmark, not only for the harbour of Esbjerg, but also for the whole of the agricultural export industry.

College of Food Technology

TECHNOLOGICAL education for the food industry up to the highest level will be provided by the National College of Food Technology, whose courses of training cover the examination, handling, processing, and preservation of all kinds of food. Both national and regional courses are to be provided, and in the case of the latter the Governors of the College have taken over the Smithfield College of Food Technology where the courses already in existence are to be continued and extended as the need arises.

Day, part-time day, and evening courses are provided to meet a variety of needs, and students are prepared, ***inter alia***, for the examinations held by the Royal Sanitary Institute in Food Inspection, Food Hygiene, and Nutrition, and for the examinations held by the Institute of Meat, and by the City and Guilds of London Institute in Milk Processing and Control.

The National Courses, which are to begin on October 6, fall into three types: (*a*) the post-graduate course; (*b*) the general food technology course; and (*c*) the special commodity course.

Under (*a*) the College offers a course of post-graduate study in applied microbiology to those who hold a suitable science degree of a recognised university or who hold equivalent qualifications. The course will provide training in general microbiology, followed by a study of those organisms responsible for food spoilage. The studies will be closely linked with practical work in the food processing laboratories. Other post-graduate courses may be arranged to provide training in certain special aspects of food processing, *e.g.* canning. Successful students will be awarded the Diploma of the College in Applied Microbiology.

The general food technology course comprises a two-year full-time day course and is available to those engaged in the food industry, but other suitably qualified applicants will also be considered. Certain organisations connected with the food industry have already agreed to release selected operatives and to pay fees and maintenance costs.

Candidates for this course should be not less than 18 years of age and possess the General Certificate of Education at the Ordinary level in at least four subjects, which should include English and mathematics, and at the Advanced level in one science subject (chemistry, physics, or biology).

The course will include instruction in the basic sciences of chemistry, physics, and biology, in refrigeration, canning, dehydration, and in other processes related to the main food industries, and will be concerned with biochemistry, microbiology, biology, and chemical engineering as applied to nutrition, hygiene, pest control, and plant operation. Training will also be given in industrial administration. It is proposed ultimately to extend the course to a three- or four-year full-time course of approximately degree standard.

Successful students will be awarded the College Diploma in General Food Technology.

The special commodity course, requiring full-time attendance for two years, is a modification of the general food technology course, and has been designed to meet the needs of the retail trades. The training is less general in character and more time will be devoted to craft practice and to matters more closely related to the work of retail trades.

Applicants without the necessary qualifications or their equivalent may be admitted to the courses if, in the opinion of the Principal, Dr. J. D. Mounfield, M.Sc.Tech., F.R.I.C., they are likely to derive benefit from it.

Active steps are being taken to build a new College, but in the meantime its work is being conducted at premises in Cranwood Street, City Road, London, E.C.1. These premises have been equipped with lecture rooms, science, microbiology, and food processing laboratories, administrative offices, and common rooms for staff and students.

In the food processing laboratories certain pilot scale plant has been installed, and it is intended ultimately that facilities for practical instruction in all the major food processing operations shall be available at pilot scale level for operation by the student.

Fruit and Vegetable Utilisation in America

A concise and informative record of all aspects of fruit and vegetable utilisation, with the exception of canning, is contained in the report* of the team which recently visited America under the auspices of the Anglo-American Council on Productivity. The products covered by the team included brined vegetables, chutney and relishes, fruit beverages, jam, marmalade, mincemeat, pickles, processed peel, processed ginger, quick frozen fruits and vegetables, salad cream and mayonnaise, sauces, and ketchups.

WHILE a detailed study of fruit and vegetable raw materials was not possible, some general observations relating to their availability, production, and quality in the U.S. have been recorded because they provide a main ingredient for all the varied products covered by the team's investigations.

Quality of Produce

The maintenance of quality of farm produce in the U.S. is due largely to observance of a system of voluntary grade standards for raw fruits and vegetables organised by the Production and Marketing Administration of the U.S. Department of Agriculture. These voluntary standards have the backing of the co-operative producing and marketing organisations, and of many processors, and it is common practice for a manufacturer to specify that his fruit or vegetables shall conform to one of these accepted voluntary grades. As a result, the bulk of raw produce entering the factories is officially inspected and certified as to grade.

The American view is that graded voluntary standards of this type are indispensable if the relations between growers and processors are to be satisfactory.

The team is of the opinion that research work in the development of new varieties of fruit and vegetables in the U.S. lags well behind the impressive work carried out in British research stations, especially in the last 20 years, and in the sphere of research activities considerable admiration for the work being done in the U.K. was expressed during the visit.

Broadly speaking, such research work has two objectives: first, the development of new varieties having better qualities than the established types, and, secondly, the breeding of disease-resistant varieties which will aid the growers by affording consistently better yields with less trouble.

Some notable work of this type has been undertaken in the U.S. in connexion with cucumbers, but nothing was found comparable with the outstanding progress made in the U.K. during the past few years in the development of new varieties of strawberries, raspberries, and other fruits.

Use of Sulphur Dioxide

One company producing excellent glacé cherries purchases the fruit fresh and puts it down in casks by a cold process. It is preserved without prior removal of stalks, with a relatively high amount of sulphur dioxide.

The total sulphur dioxide content aimed at is 5,000 p.p.m. Of this, 1,250 p.p.m. are in the form of sulphur dioxide solution and 3,750 p.p.m. in the form of calcium bisulphite solution. This mixture is considered to give the ideal texture when the fruit is subsequently processed into glacé cherries, but the precise balance between sulphur dioxide and calcium bisulphite would presumably depend upon the variety and maturity of the cherries to be used, and the ideal mixture suitable for British fruit would therefore be a matter for experiment. The time of storage before use for processing would also be an influencing factor; the company using the method described above did not keep its cherries for longer than six to nine months before processing.

U.S. regulations prohibit the use of fruit preserved in sulphur dioxide in the manufacture of jams. Hence it was found that all fruit used was (*a*) fresh, (*b*) frozen, or (*c*) canned.

Production from fresh fruit is carried out during the fruit season, but no special effort is made to manufacture any great amount because a switch to frozen fruit is made with complete indifference. In fact, fresh fruit production takes place only to fill orders current at the time; moreover, it is used only if the factory is close to the growing areas.

The general procedure is for fruit to be frozen or canned within two or three hours of picking and held in storage by merchants specialising in this work. The manufacturer then draws from these merchants as and when required.

Fruit for Jams

All strawberries are bought plugged and frozen in sugar (apart from the very small amount used fresh). The normal proportion of fruit to sugar is four of fruit to one of sugar, but in certain cases it was found that a three-to-one or two-to-one pack was accepted and preferred.

Raspberries are frozen either with no added sugar or with equal parts of sugar. Blackcurrants are not grown and are never used for jam; nor was any gooseberry jam seen. Redcurrants and cranberries are frozen without sugar. Apricots are either fresh or canned in five-kilo cans similarly to Spanish fruit.

All the varieties of plums that were seen seem to have either deep red or purple flesh and are either frozen, with or without sugar, or canned. In every sample of frozen plums that was inspected the team saw what, in the U.K.,

* Abstracts from *Fruit and Vegetable Utilisation*. Pp. 56+xii. Anglo-American Council on Productivity. Price 4s.

would be an objectionable brown colour. There was a tendency for this, too, in the frozen strawberries, which also had a definite characteristic "frozen" flavour not nearly so attractive as the fresh British fruit.

All members of the team agree that there seems to be a lack of flavour in many American fruits. This is reflected in the jam made from them. Despite the higher fruit content of the U.S. jams, it was often felt that the British product has a better fruit flavour. The colour of preserves is not considered of such great sales importance as in the U.K. Hence any browning effects due to freezing are not considered objectionable unless they are very pronounced.

Marmalade—almost invariably made from sweet oranges—is manufactured either from the fresh fruit or from canned oranges.

The Pickle Industry

The pickle industry in the U.K. cannot be compared with that in the U.S. In the U.K. the demand is varied, with the emphasis on onions, piccalilli, and sweet pickles, whereas the overwhelming demand in the U.S. is for gherkins. The sizes vary from the small midgets to large chumps (also known in this country as ridge cucumbers), but the great preponderance in production is of the larger sizes. The technical name used in the U.S. is "cucumbers," but it is evidence of their popularity that in the American idiom cucumbers are called "pickles."

Cauliflower as Ingredient

Cauliflower is an ingredient of minor importance. Quantities available during peak periods of the crop appear to be generally sufficient for normal trade requirements. Grading is in accordance with Federal standards, U.S. No. 1 being equivalent to our extra selected grade. Possibly owing to the fact that preservatives and hardening agents are invariably used, so as to inhibit softening and discoloration, there has been little necessity for field work and research.

The preservative agents are sulphur dioxide 500 p.p.m. or sodium bisulphite, $7\frac{1}{2}$ oz. per 40 gal. cask.

The hardening agents are calcium chloride or alum, and the usual brine strength is from 75° to 80°.

Some manufacturers, instead of purchasing brined stock, purchase cauliflower in sweet liquor, which can be used immediately without prior preparation. The specifications are as follows:

Soluble solids	35 per cent. minimum
Acidity ..	2·75 to 3·25 per cent.
Beaumé ..	19·5° to 20°.
Type of container:	Casks of 40 gal. capacity, lined with paraffin wax.

Onion Production

The main usage is of imported silverskin onions, mostly of smaller grades (cocktail onions). There is a small domestic supply, but climatic reasons and high costs of production have not fostered their cultivation to any large extent.

Brown pickling onions do not appear to be in great demand, and the small quantity used is bottled in sweet vinegar or incorporated in mixed pickles.

Federal standards have been enacted for all onions, both for domestic use and for processing. The grading is based on very well-defined standards of quality, and the official "definitions" leave little room for misinterpretation.

The top grade is termed U.S. No. 1, with sub-divisions as follows:

	Diameter
U.S. No. 1 Picklers	Max. 1 inch
U.S. No. 1 Boilers	Min. 1 inch, max. $1\frac{7}{8}$ inch
U.S. No. 1 ..	Min. 2 inch

As with cauliflower, some manufacturers purchase peeled onions in sweet liquor. The specifications are as follows:

Soluble solids	35 per cent. minimum
Acidity ..	2·75 to 3·25 per cent.
Beaumé ..	19·5° to 20°.

Production of Virus-free Gherkins

Much research has been undertaken in the production of virus-free and other new varieties of gherkins, *viz.* slender and without any pronounced spines, approximating to European types. The general standard of quality in the U.S. does not appear to be as high as in Europe. The crop is used in two ways. During the growing season fresh unbrined cucumbers are taken into the factories, where they are packed whole or sliced into sweet dill vinegar and then sterilised.

After the cropping season is over, brined gherkins are used. These are preserved in brining stations adjacent to the various growing areas. The largest pickle manufacturers have their own organisation, but the majority of packers purchase their requirements from a briner. Gherkins are invariably grown on a contractual basis and varying prices are paid for the different grades. As a protection to the packer, prices can be reduced if the crop is heavy. Seed is supplied by the purchaser, who also gives full instructions for cultivation.

The produce is delivered to a local receiving station or to the brinery, where the gherkins are graded over a slat grader, and the weight is recorded of each grade. Unsuitable gherkins are taken back by the grower. Government inspectors are available to supervise the grading and quality.

Tomato Purée

Tomato purée in the U.S. was found to be of a very high quality. It is of a bright red colour, finely sieved, and of good flavour. During the growing season there is a direct production line from the fresh fruit to the finished product, *viz.* ketchup, chili sauce, etc. Afterwards canned tomato purée is used. The machinery used in its manufacture is of stainless steel and the method is the hot-break process by which the full retention of the tomato pectins is ensured.

Government standards for tomato purée and paste have been enacted. In ascertaining the grade up to 60 per cent. of the points are given for colour, the balance of the points comprising the grade being for absence of defects. Manufacturers when purchasing tomato purée specify fancy, standard, or sub-standard grades, in light, medium, or heavy concentrations, and can obtain a Govern-

ment certificate of grade for their purchase.

The standards incorporate the method for ascertaining the range of colour within the grade. The system is by disc-spinning colorimetry, using coloured papers. This is a method which has been supplanted in the U.K. by the use of coloured glasses. It was found that the use of paper involved loss of accuracy with use, by nature of the change in the surface of the paper, whereas glasses are permanent.

The Food and Drug Administration has also promulgated a regulation classifying the ingredient in the following terms:

1. The liquid obtained from mature tomatoes of red or reddish varieties.
2. The liquid obtained from the residue from preparing such tomatoes for canning, consisting of peelings and cores with or without such tomatoes or pieces thereof.
3. The liquid obtained from the residue from partial extraction of juice from such tomatoes.

When ingredients 2 and 3 are used, they must be specified on the label. Purchasers are then aware that the total solids have been increased by the addition of such residue extracts.

Availability of Raw Materials

The abundance of all raw materials in the U.S. is a major factor in the continuous high productivity of the food industry. Even in times of temporary shortage in the U.S. the American manufacturer can purchase his supplies freely from other parts of the world. The natural resources of the country are continually being explored and extended by the speedy application of modern scientific methods. At the present time British manufacturers are dependent to a large extent upon imported supplies. The team feels, however, that every effort should be made to foster the maximum production of raw materials in the U.K. at prices and standards of quality which are acceptable to the food manufacturing industry.

Techniques of Production

The wide variety of products covered by the team involved many differences in production methods. Despite these inevitable differences, however, the team found certain basic principles governing the technique of production throughout the whole field of its investigations.

Everywhere it was found that both management and labour attach the very greatest importance to high productivity, which is regarded as a vital key to successful production, and anything that can be done to increase output per man-hour receives the fullest attention and the highest possible priority.

The driving force provided by this attitude of mind is mainly translated into action by means of efficient machinery and ingenious layouts. In general, the team found better machinery, more machinery, and greater ingenuity in its use than are found in the U.K.

Use of Glass Containers

The majority of the products made by the industries covered by the team are packed in glass containers. Two points are of some importance in this connexion. First, there is no doubt that the glass containers available in the U.S. are very much more robust than their British counterparts. The quality of the glass is such that, where necessary, it can be handled much more roughly than would be possible with its British equivalent.

The team was informed that this toughness is due to certain minor ingredients in the composition of the glass. This is a point that should receive close attention by glass manufacturers in the U.K.

Secondly, glass containers in the U.S. are standardised in capacity and dimensions within much narrower limits than are usual in the U.K. This is of the utmost importance in permitting high-speed automatic filling to predetermined weights and in assuring the uninterrupted and efficient working of high-speed capping with metal closures.

Glacé Cherries and Cured Peel

Cherries preserved as aforedescribed are first sent through a stemming machine. As the removal of the stems is not completely effected the cherries then pass over a belt where the few stems still remaining are removed by hand; the cherries are then sent through a grader from which they drop into casks of cold water to prevent bruising.

Following the grader, the cherries are pitted by a suitable machine. It was noted that the stones came out absolutely clean and the cherries were automatically halved. The output from one such pitting machine was stated to be 800 to 1,000 lb. per hour.

It was found that the curing of glacé cherries is carried out in large stainless steel tanks; in one instance these were of 1,200 gallons capacity. It is important that the stainless steel used for these tanks should be resistant to sulphur dioxide, hence a molybdenum steel is used.

The actual process of glacé-ing is as follows:

> The halved pitted cherries in sulphur dioxide are filled into the tank and blanched for from 45 to 60 minutes by boiling water circulating through them.
>
> After draining, a suitable amount of citric acid, colour, and the first syrup are filled into the tank. The strength of the first syrup was stated to be 10° Brix. The syrup is refreshed each day for 14 days, increasing the Brix by 5° to 10° per day.
>
> This process continues until at the end of the curing period the final Brix is 77° minimum to 80° maximum.

The syrup used is a mixture of commercial glucose syrup with invert sugar and sucrose. Whatever the Brix of the syrup the relation between the glucose solids, invert solids, and sucrose remains constant, and is glucose solids 50 per cent.; invert sugar solids 25 per cent.; and sucrose 25 per cent.

It was also stated to be very important that the temperature throughout the whole of the curing process should not be too high; it was suggested that the maximum temperature to obtain a properly cured article of good quality is 120°F.

Cured peel is processed by a

method very similar to that used for glacé cherries.

The stages are as follows:

The preservative liquor is drained from the half-caps of sweet oranges which have been held preserved in sulphur dioxide, and the raw peel is then blanched for five minutes in boiling water.

If the final product is to be diced (*i.e.* cut peel), the raw peel is diced at this stage and is then placed in stainless steel tanks (in one instance these were of 500 gallons capacity). As in the process for glacé cherries, arrangements are made for continuous re-circulation of the curing syrups by constantly withdrawing syrup from the bottoms of the tanks and returning it through sprays fitted over the tanks.

The first syrup is of 20° Brix. This is refreshed and strengthened each day—or even twice a day—until curing is complete in seven to eight days with a final Brix of 77°. The composition of the syrup is as used for glacé cherries, and once again it is considered important that the temperature of the syrup should be kept between 105°F. and 120°F. during the processing period. Suitable heating arrangements are incorporated in the curing tanks.

The process described above enables production of a first-class article in a shorter time than that usually found necessary in the U.K. The use of large stainless steel tanks is hygienic and efficient, and the constant re-circulation of syrup, besides hastening the curing process, appears to produce even absorption and an attractive product.

Jam Manufacture

With the exception of one small factory, the actual boiling process used for jams was radically different from the British method. There were variations in detail in the different factories visited, but essentially the process is as follows:

Sugar, water, and pectin are heated to about 140°F. in open pans in batches varying from 200 lb. to 300 lb. in weight.

The fruit is then added and several such batches are transferred by suction or pumping to very large vacuum pans where boiling is continued under a vacuum of 25 to 28 inches, with a final temperature of 130°F. to 140°F. according to the vacuum used. The charges in the vacuum pans vary from about 2,000 lb. to 2,500 lb.

At the completion of the vacuum cooking, there are two alternative procedures. In the first, the jams are filled direct into jars followed by immediate steam-injection capping. As the filling temperature in this case is only about 140°F. it is necessary, after capping, to pass through a steriliser. In the second, the charge from the vacuum pan is transferred again to open pans and the temperature brought up to 195°F. It is then immediately filled into jars and capped by steam-injection. In this case no further sterilisation is needed because the jam (at 195°F.) is itself sterile and the steam-injection capping takes care of the head space.

Filling, Capping, Labelling, Cooling

The filling machines used are very efficient and there is a noticeable absence of slopping or drip. A steam-injection capping machine is in all cases linked directly with the filling machine. The team found that this type of capping was used almost universally for a large variety of products.

If sterilisation after capping is necessary, the capped jars are then passed through a steriliser. In these sterilisers the jars pass through a long trough of very hot water (total immersion) or under hot water sprays; steam sterilisation is not used. The ingenious design of these hot water sterilisers ensures a clean and tidy job; there is no water on the floor and no steam escapes into the air of the factory.

Immediately after emerging from the steriliser or, if the second of the alternative procedures is used, immediately after capping, the jars are labelled as they pass in an upright position along a conveyor belt and are then automatically filled into two-dozen (or other size) cartons ready for despatch.

The cartons of hot jam are then stacked and allowed to cool naturally. Generally no special efforts are made to accelerate cooling. In one factory, however, the jars were passed under a cold water spray at the end of the steriliser.

The process described obviously lends itself to a high rate of productivity, but these results are obtained only at a definite sacrifice of quality as known in the U.K.

Colour and Flavour Problems

It was noticeable that the boiling of the jam in batches of about one ton—even under vacuum—resulted in almost complete breaking up of whole fruit and a distinct darkening of colour owing to oxidation and slight caramelisation (quite apart from any tendency towards brownness in the original frozen fruit used), for even with a very high vacuum a boiling time of 30 to 45 minutes is necessary with such a large batch.

Another interesting point is that the chief chemists at two of the factories which were visited both hold the opinion that vacuum boiling for up to 40 minutes results in more loss of the natural volatile flavours of the fruit than open pan boiling for a shorter time.

The adverse effects on colour are undoubtedly accentuated by the absence of controlled cooling of the finished article. What in the U.K. would be called "a good gel" is not considered vital as long as the preserve is sufficiently "stiff." It is significant that where the jelly type of jam (bramble, cranberry, etc.) is being produced this is invariably done in small batches in an open pan and vacuum boiling is not used.

The product is, nevertheless, acceptable in the U.S., and it is evident that the consuming public has either never been educated up to expect the British degree of quality in such matters as whole fruit, colour, flavour, and good gel, or else has been slowly educated down to accept the present position.

One final point should be men-

tioned. The large batch vacuum boiling made it difficult to control the invert sugar percentage of the jam. It is significant that there was a history of "sugary returns" in some of the factories visited. This, however, is minimised by the extraordinarily rapid sale in the U.S. It is said to be rare for a jam to reach the actual consumer more than two months after manufacture, while two of the principal manufacturers guarantee their product for only six months.

Tomato Ketchup

Fresh tomatoes are delivered to the factory in boxes supplied by the manufacturer. They are inspected by a member of the manufacturer's quality-control staff and a Government inspector. As soon as quality is approved the tomatoes are used for processing.

The box containing the tomatoes is dumped on to a sorting conveyor where badly blemished tomatoes are removed. While still on the conveyor they are spray-washed and then dropped into air-agitated soaking tanks for further cleaning. From the tanks they are automatically transferred to another conveyor where they receive another spray-wash with water at approximately 60 lb. pressure.

Trimming is done by hand, defective parts of the tomato being cut out with a knife, following which, after a final rinse under sprays, they drop into a powered chopper. The chopped tomatoes are then scalded for five to ten minutes and pumped to holding tanks. From the holding tanks the chopped tomatoes drop into a pulper which removes cores, skins, and seeds; they are then pumped to further holding tanks.

Final preparation takes place in stainless steel kettles with powered stirrers. The pulp is delivered by gravity in measured quantities and spices, sugar, vinegar, and other ingredients are added. The whole is brought to the boil and then pumped to a heated storage tank. From there it is pumped through a finisher and a heat exchanger.

The product enters the de-aerator as a fine spray at a temperature of approximately 203°F. The de-aerator operates at a vacuum of about 9 inches of mercury. The product boils under vacuum until a temperature of approximately 196°F. is reached. This 7° drop, which is known as the flash, ensures that the product is boiled, thus liberating the trapped air and allowing it to escape to atmosphere with water vapour.

From the de-aerator, the product flows through some 30 ft. of piping to the filling hopper with a temperature drop of approximately 5°. A filling temperature of not lower than 190°F. must be maintained.

After filling and capping, bottles are cooled by water to approximately 90°F. before labelling and packing. Filling speeds of 135 per minute were seen. A vapour vacuum cap is used.

The filling, labelling, and packing operations are designed to give a smooth flow with the minimum of handling. After filling, capping, and cooling, the stream of filled bottles is divided automatically to serve to labellers. The flow of bottles joins together again to feed an automatic case packer which packs twelve bottles per case, the case being discharged to a conveyor leading to the automatic case-sealer.

Mayonnaise and Salad Cream

The team saw the production of a high-class mayonnaise in a factory which combined quality with the high productivity arising from ingenious mechanisation.

The edible oil used in this case was cottonseed oil with an average acidity of only 0·03 per cent. This oil, refined in the company's own refineries, is used within 24 hours of refining. The vinegars used as the acid ingredient were here normally a blend of various types—mainly distilled and cider vinegars, though malt vinegar had also been used at one time. The eggs are almost entirely fresh shell eggs with the addition of a very small percentage of frozen egg yolk. The spices are conventional, *i.e.* mustard, paprika, etc.

The essential details of the production methods employed do not differ widely from current British practice, but ease of production and high rate of output are facilitated by the excellence and ingenuity of the plant used.

Batches are automatically weighed and blended with the premixed sugar and spice components. Where excessive sweetness is not desired, the sugar component would be dextrose, but normally sucrose is used.

The mixture is then pumped through a sieve strainer. Suitable amounts of refined oil (cooled to below 55°F.) and vinegar are then incorporated in the mix and the completed batch is given a relatively slow-speed pre-mix before emulsification through a highly efficient emulsifier. The finished mayonnaise is then immediately filled into glass jars (the half-pint size being filled at 84 per minute). Labelling and packing follow.

No antioxidants are used. Such compounds, although permitted in certain other foodstuffs in the U.S., have not yet been officially allowed in the mayonnaise group of products. No special steps are taken by this company to ensure the stability of the emulsion. It is, however, fully realised that mayonnaise of this type is a delicate emulsion and customers are warned not to expose the product either to excessive heat or cold, or to strong sunlight.

Processing Methods for Gherkins

The method of processing is as follows:

The gherkins are fermented, cured, and stocked in large wooden vats, made from Cyprus or Oregon pine, the dimensions of which are 14 ft. diameter and 8 ft. deep. The capacity is about 20 tons. Storage in casks is undertaken only by the small manufacturer.

Deliveries of brined stock are made in containers holding about 25 tons, and the gherkins are then mechanically handled by the manufacturer and stored into vats where they are de-brined. Two methods of brining are employed.

The first is known as the "quick cure." A light brine is employed. Stock cured in this way must be used before heavy frost, otherwise serious spoilage might occur. The process commences with a 34°

"salinometer" brine and the strength is increased by 1° per day until 37° is reached, then increased by ½° per day until the final strength of 40° is attained.

The second method is known as the "long cure." This process commences with a 34° brine for large fruit and a 40° brine for small fruit, and the brine strengths are increased as follows:

By 1° per day to 37° (large sizes) and 43° (small sizes).
By ½° per day to 40° (large sizes) and 46° (small sizes).
By ⅓° per day to 60° (large sizes) and 70° (small sizes).

Recent developments have shown the importance of the relation between brine strengths and temperature and alteration of the above figures must be made for this factor.

It is obvious that a strong brine in a low temperature would inhibit satisfactory fermentation. On the other hand, a low brine strength in a high temperature would cause too rapid a fermentation with possible consequences of softening and deterioration, or at least an undue percentage of hollow gherkins.

A rough guide is as follows:

55°F. to 60°F.	..	20° brine
60°F. to 65°F.	..	30° brine
75°F. to 80° F.	..	40° brine

The brine strengths are increased by the addition of dry salt over the tops of the vats in predetermined quantities. Tests of brine are taken at the top, middle, and bottom of the vat, and the average strength is determined. Under warm conditions, when fermentation is extremely active, dilution of brine is extremely rapid and it is therefore necessary to pump the brine over from the bottom to the top of the vat.

Some packers utilise their brine several times as the high lactic acid content ensures a speedier fermentation, but it is desirable that such re-use should be made only under laboratory control. Cleansing of vats is effected by pebble lime and water mixed to the consistency of whitewash. After five minutes, the vats are rinsed and this is repeated until there is no trace of yellow or green

(*Continued on page 374*)

Methods of Herring Preservation

SUCCESSFUL preservation of fresh herring should prevent rancidity in the fat and also changes in the texture of the flesh. Rancidity can be prevented by glazing the frozen fish with a thin coat of ice by dipping them in water or by spraying them and storing at −4° to −22°F. Fish so treated will keep in good condition for three to six months or more. Changes in flesh texture can be avoided by quick freezing before storing under the same conditions.

A recently published report* describes pilot scale trials on the freezing and cold storage of herrings. Some 137 tons of fish were quick frozen and cold stored at about 0°F. and −17°F. under commercial conditions. Two methods of freezing were used, some of the herrings being frozen in a multi-plate freezer, the rest in an experimental air-blast freezer. On examination, it was found that fish frozen by either method and stored at −17°F. were suitable for kippering or distribution as "fresh" herrings after as long as nine months in store, but at 0°F. the storage period was cut to six months or less.

To maintain a supply of kippers throughout the year, the herrings can be frozen and cold-stored immediately they are landed; they can then be withdrawn from storage and kippered as required, to keep the smoke-curing plant working steadily through the year. This method produces the best kippers. Alternatively, the herrings may be kippered on landing and the kippers stored before release to the market. The kippers will remain in good condition for about three months at −4°F. or five months at −22°F. Good kippers can be produced in this way, and the simple freezing process involved may sometimes be preferred to the freezing of herrings as a means of spreading seasonal supplies over the year.

* *The Freezing and Cold Storage of Herrings.* By A. Banks, B.Sc., Ph.D. (Liverpool), F.R.I.C. Special Report No. 55 of the Food Investigation Organisation, D.S.I.R. Pp. 40+iv. H.M.S.O. Price 1s. 6d.

Meat Production, Curing, and Cooking

Two books on meat and its treatment, written from different angles, have recently been published. The first,* by Ambrose Heath, approaches the subject from the point of view not only of the cook but also of the pig breeder. He starts from the moment when the pig has been killed and its body is to be transformed into pork or bacon.

The increasing number of small pig-keepers will find detailed instructions for the home curing and smoking of bacon and ham as well as a number of cures not usually found in the cookery books.

In addition to this, the author discusses such things as chitterlings, fry, liver, heart, ears, trotters, and black puddings. Those looking for something new might try stuffed pig's ears, pig's tails, or pig's lung soup, but these merely figure among a large number of more attractive sounding dishes.

The second book† is written for the butcher and presents in a clear and practical form suggestions, tables, and formulae which will be of value to those engaged in the sausage and prepared meats industry.

The book has been compiled for the established manufacturer as well as for the education of the beginner and all the information contained in it is based on actual practical experience.

* *Pig Curing and Cooking.* By Ambrose Heath. Pp. 195. Faber and Faber. Price 10s. 6d. net.

† *The Butchers' Manual.* Third edition. Pp. 125+viii. John Crampton and Co. Price 13s. post free.

FUTURE ARTICLES

ARTICLES to be published in forthcoming issues of FOOD MANUFACTURE will include Part III of "The Chemistry and Physics of Macaroni Products," by J. A. Radley, M.Sc., F.R.I.C., and "Soya—Staple or Substitute," by E. M. Learmonth, M.Sc. (Lond.), F.R.I.C.

The Chemistry and Physics of Macaroni Products

Part II

J. A. Radley, M.Sc., F.R.I.C.

In this instalment, the author discusses the important question of colour in macaroni products from various aspects and the effects of the mixing and kneading processes on quality.

IN considering the connexion between the colour of wheat, semolina, and macaroni it is possible that the colour of a sample of wheat may appear bright and give the impression that good, bright amber semolina might be milled from it, whereas in practice it may have a grey or brown colour.

The carotenoid content of Carleton, Stewart, and Vernum varieties compare favourably with Mindum but may not always reflect the true colour of the macaroni made from them. Some durums, notably Golden Ball variety, have a rather high carotenoid content in the semolina but give a pale macaroni. The cause of this behaviour is not known, and the correlations between colour and the various constituents of the grain are discussed more fully below. Some workers believe that enzyme action plays a part in the discolouring process, but all that can be stated factually is that carotenoid pigments are susceptible to oxidation to colourless or weakly coloured bodies. This may explain the bleaching of colour of semolina on ageing or storing.

Incidentally, the different pigments present in wheat are broadly classified chemically into: (1) carotenoids, *e.g.* carotene and xanthophyll, and (2) flavones. It is the first group only that appear to be decolorised on storage.[23]

Factors Governing Colour

Semolina colour is modified by many factors, some hereditary and some environmental. The Mindum variety has become accepted by the trade because it produces macaroni that is clear, bright, and translucent. The granulation of semolina has an important effect upon colour and is therefore carefully controlled by the millers; the finer the granulation the poorer is the colour owing, principally, to more severe treatment in milling.

Examples of environmental factors influencing macaroni colour are climate, soil, disease, or storage conditions, and processing technique. In years of high rainfall the colour characteristics of the crop are different from those in a dry year. A disease such as black point may cause splotchy macaroni colour, or ergot may cause black specks. Stem rust may shrivel the kernels, increasing the amount of yellow colour per given weight, but making the removal of bran particles more difficult. Finally, the colour of the best durum may be ruined by poor storage or careless processing.

Even though there was considerable variation in the colour score for a given variety of durum wheat in different years, the relative position of the varieties one to another has been found by several workers[24] to be very constant from year to year.

Environment of growth may outweigh varietal differences so that a good variety grown under poor conditions will yield a poorer macaroni than a poor variety grown under good conditions.

Properties of Macaroni Products

Le Clerc[25] was one of the first workers to give serious scientific attention to macaroni products, but it was not until the papers by Fifield, Smith and Hayes,[26] and Binnington and Geddes[27] that laboratory scale equipment for milling and processing was used to follow the effect of the various processes on the properties of macaroni products. These workers did not extrude the material but compressed it into tablets or discs, a technique which was followed by other workers[28] who also obtained significant differences in macaroni colour and appearance between various durum wheat samples. They pointed out the significance of pressure in developing translucency but did no work on the effect of the drying process.

In 1939[29] they showed that macaroni quality cannot be predicted from any single analytical test applied to wheat and that the estimation of wheat carotene alone is valueless as an index of macaroni colour, particularly for intervarietal prediction. They measured the colour of the macaroni discs by matching with Munsell colour discs and gave formulae for calculating single-figure colour scores from both Munsell and Wallace and Tiernan colour discs.[30]

Binnington and Geddes[27] consider that only three varieties, *viz.* Arnautka, Mindum, and Akrona, can be considered as consistently yielding macaroni of satisfactory commercial quality over a period of years; the latter variety they class as "borderline." Wheat carotene content, however, is definitely a varietal characteristic. Neither of these factors, individually, is closely associated with macaroni colour score.

They made use of n-butyl-alcohol, a new solvent for carotene, which made possible the estimation of the actual pigment content of ground macaroni, since this solvent releases appreciable amounts of pigment which could not be extracted with the naphtha/alcohol mixture formerly used for this determination. While the use of n-butyl-alcohol permits the recovery of larger quantities of pigment from macaroni than naphtha/alcohol, the values obtained with it rarely approach the corresponding semolina values.

Significant positive inter-varietal correlations were obtained by these workers between wheat carotene and macaroni carotene,

and between semolina carotene and macaroni carotene. Negative inter-varietal correlations were found between wheat protein and wheat carotene and between semolina protein and semolina carotene.

Macaroni Discs for Colour Comparison

The above results, which are the summation of work by a number of investigators,[26, 31-34] were obtained by a technique embodying the making of macaroni discs for the colour comparison, and Sibbett and Harris[35] have prepared macaroni discs and tubular macaroni from the same series of semolinas, and conclude that the colours judged from the micro-macaroni discs could, with limitations, be used as an index of the colour of the actual macaroni produced commercially.

Other work was directed rather more towards the visual colour scores of the discs for different varieties, pressures, and temperatures. They found that the effect of the variety is the least marked, and that the pressing time of 60 seconds and pressure of 2,000 lb. per sq. in. gave the most satisfactory results.

Their results also explained why the first lengths of macaroni extruded from the press are dull, of poor colour, and lifeless, since the extrusion of this portion takes place before the pressure in the press has built up over a sufficient length of time to overcome the plasticity of the mass and to compress the numerous small air bubbles present into fewer larger air bubbles, which have far less effect on the translucency and visual characteristics of the product than have the small bubbles. This point is discussed more fully later.

Fifield, Smith, and Hayes[26] also confirmed the close correspondence between the disc colour values and colour values for the corresponding tubular macaroni, but consider that the older tests, such as a visual inspection of the grain, wet and dry slicks of the semolina, protein test, and solvent colour extractions of carotene, are still important as auxiliary tests of both large and small samples but fail to give a complete measure of the quality of the final product. They further maintain that pressure is apparently the most important factor for bringing out the clear translucent colour so desired in the product.

The present author is of the opinion that variation in intensity of yellow colour of different macaronis from different factories in this country is often not so much due to variation in the amount of yellow pigment originally present as to the difference in the physical state of the product as influenced by pressure and temperature of extrusion and the drying technique used. All these factors can bring about profound changes in the shade and intensity of the colour and in the physical appearance of the product.

Pigment Destruction in Processing

Recent work by Irving and Winkler[36] shows the important effect of processing on the original colour of the semolina. These workers examined the destruction of the xanthophyll pigments during the mixing stage of macaroni processing under a variety of mixing conditions.

Processing the semolinas by the disc method of Cunningham and Anderson, they found that the percentage of pigment destroyed during processing varies from about 20 per cent. for the best varieties to about 60 per cent. for the poorest varieties. Destruction was shown to occur principally during mixing, although a small additional loss occurs during extrusion.

The destructive reaction occurs in three distinct stages: (1) a rapid reaction during the first minute of mixing, (2) a slower zero order reaction during the period from one to about six minutes of mixing, and (3) a still slower reaction, apparently zero order, beyond six minutes of mixing.

For convenience, the first two stages of the reaction are termed the "initial reaction" and the "mixing reaction" respectively, and it was found that the rates of both reactions are much greater for a poor variety of semolina than for a good one. These workers demonstrated that the initial reaction occurs as a result of wetting the semolina.

Destruction of pigment obviously occurs during mixing, and when mixing is stopped the destruction of pigment ceases even when the dough is handled wet through several subsequent stages and finally dried over a period of 48 hours. The explanation appears to depend on the emulsifying action of the mixer. The pigment, being fat soluble, is probably associated in the cell with a lipid fraction so that, after the addition of water and the formation of a cohesive dough, the lipid and aqueous phases are apparently emulsified by mixing, thus enabling an oxidising reaction catalysed by lipoxidase to proceed. It is suggested that when the two phases are combined, the rate of the reaction is rapid by comparison with the rate at which the mixing reaction brings them together.

Oxidation of Carotenoid Pigments

Much work has been published in recent years on the coupled oxidation of carotenoid pigments during the peroxidation of unsaturated fats by lipoxidase, and this work has recently been reviewed by Bergstrom and Holman.[37]

Lipoxidase activity has recently been reported in wheat flour by Miller and Kummerow.[38] An interesting feature of their work was the course of the reaction in an atmosphere of nitrogen. The "initial reaction" takes place, but during the mixing no further destruction of pigment occurs in the absence of "atmospheric" oxygen.

There appears to be a limiting value, which may vary from sample to sample, for the moisture absorption beyond which no increase in rate of pigment destruction is apparent. This behaviour is probably connected with the quantity and quality of the protein present.

The effect of temperature is complex. Increasing temperature will hasten the formation of a cohesive dough, and affects the

state of the dough and the rate of emulsification of the enzyme and lipid phases. In addition, it displaces any chemical equilibria involved in the reaction.

The semolina is sifted and all foreign matter removed.
Leonard Hill photo.

Inhibition of Pigment Destruction

Irving and Winkler[36] also examined the effects of the following enzyme inhibiting agents at hundredth or thousandth normal strength: cyanide ion, mercurous ion, sodium chloride, sodium fluoride, copper sulphate, lead acetate, alpha naphthol, and ethyl alcohol at 30 per cent. strength. Cyanide, mercurous ion, copper sulphate, alpha naphthol, and 30 per cent. alcohol had a significant effect on the reaction, the mercurous ion accelerating both stages and copper sulphate accelerating the initial stage only of the reaction. Cyanide inhibited both stages, a ten-fold increase having little further effect on the amount of inhibition. Alpha naphthol inhibited the initial reaction very markedly, but had less effect on the mixing reaction, and 30 per cent. alcohol accelerated the initial reaction and almost completely inhibited the mixing reaction.

The acceleration of the initial reaction by alcohol was constant for all concentrations from 5 per cent. to 35 per cent., and at 40 per cent. a marked inhibition of the initial reaction took place.

Alpha naphthol appears to act as an antioxidant rather than as a true inhibitor, and it probably competes successfully with the pigment as substrate for the enzyme until it has been used up, after which the pigment oxidation again proceeds.

Probably the most convincing evidence that the enzyme lipoxidase is involved in the destruction of pigment during mixing is furnished by the behaviour of the system on the inclusion of lipoxidase in the dough.

Thus it is possible, by the addition of a crude lipoxidase concentrate, to obtain the characteristics of a poor variety from a good variety and to make a poor variety considerably worse. Destruction of the carotenoid pigments during mixing appears to involve an enzymatic oxidation reaction, since oxidation of carotenoid pigments by atmospheric oxygen is normally a slow process[27] and the oxidation products appear to contribute nothing to the yellow colour of the macaroni.

In a further paper Irving and Winkler[39] examined the reversal of the pigment oxidation during the mixing of macaroni doughs in 40 per cent. alcohol, and they postulate a possible mechanism to account for their observations.

Development of Browning

This oxidation process appears to be quite distinct from the off-colours developed during storage of macaroni under adverse conditions; work in the author's laboratory has shown that a type of "browning reaction" then takes place, which masks the pure yellow colour of the macaroni, and that this browning can be inhibited by keeping the conditions in the macaroni adverse to those necessary for the condensation between the nitrogenous compounds and sugars which produces the brown material. The carotenoid pigments are not involved in this process; the author has found that when they are completely removed from the semolina, which is then made into macaroni, the browning can develop, or can be artificially retarded, in the same way as for untreated semolina.

Although the above work on inhibiting agents is of interest in explaining the mechanism of the reaction its practical applications are limited. It does, however, indicate that a macaroni press which has been evolved in the last four years is designed on sound lines inasmuch as in this press the water and semolina are mixed, kneaded, and extruded under vacuum. It also indicates that machines mixing and then extruding within a short time with only a limited access of air to the mixing material, as in the Buhler machine, will retain more colour than when the material is processed by the older and longer methods.

Irving and Anderson[10] examined the rate of enzymic destruction of pigment during mixing and the macaroni colour obtained from semolina of different particle sizes. In general, the enzymic destruction of the pigment increased with decrease in particle size, but the macaroni colour, on the other hand, passed through an optimum, the particles passing through 40 mesh and retained on a 60 mesh sieve giving a decidedly superior colour. Fractions of semolina of finer size gave macaronis which were dull and had a fainter yellow

The flow of semolina and water is controlled prior to mixing.
Leonard Hill photo.

colour. The dullness was partly a function of particle size alone and partly due to an increasing brownness.

The Effect of the Mixing and Kneading Processes on Quality

For long goods, *e.g.* macaroni, spaghetti, and vermicelli, a dough is made from water, semolina, and sometimes a little salt. The use of a high quality semolina is desirable in such products to prevent stretching and breaking in the drying process. Such high strength is not so necessary in short goods as elbows, shells, pearls, and alphabets, since they are dried on mesh trays.

In a number of processes for making long goods the semolina, salt, and water are mixed in large, slow-speed mixers until the granular appearance of the mix begins to disappear.

During mixing it is considered desirable to secure minimum development of gluten and minimum heat of friction, since the latter is said to reduce the colour. The quantity of added water is about 25 per cent., but a greater percentage of water, within limits, is claimed to improve the final colour of the product, but has to be paid for in evaporation costs during the drying stage. Higher moisture content may also lead to other difficulties, such as lack of strength before prefanning.

A really stiff dough is desirable for macaroni, and even less water is used when the dough is to be used for vermicelli. Since it is not easy to make a stiff dough completely homogeneous it is often kneaded or rolled, after mixing for 10-15 minutes. Following this operation some workers consider it highly desirable to "rest" the dough for a short period to take the "strain" out of it.[16]

The necessity for kneading and for a rest period is debatable. Cunningham and Anderson[31] point out that consistency is extremely important in macaroni making, and this can be uniform only if thorough mixing is achieved. Although these workers consider sheeting and folding or kneading desirable, they omitted the rest period in their small scale experiments since it appeared to have no effects on their products. This does not mean, however, that it can be entirely neglected in full scale practice.

In the Buhler process no rest period is possible since the semolina and water are fed into the machine continuously while macaroni is extruded at the other end. The design of the Buhler machine is as near ideal as possible for obtaining complete mixing with evenness of temperature throughout the mass. It applies high pressure to the dough at the point when it is required, and there is a pressure drop between this point and the extruder die which tends to give a smoother product. The machine will also run with little attention, for long periods producing consistently good quality products. Furthermore, as previously mentioned, little air is present when the mixing is in progress, and this leads to less destruction of the carotenoid pigments.

Longer mixing times increase the opacity of macaroni products since more bubbles are formed in the mix and these can exert an appreciable influence on the appearance of the final product. This factor is more fully discussed below. Binnington and Geddes[41] considered that the rest period in their trial mixes allowed the temperature of the mass, and its consistency and plasticity, to become uniform throughout, so that it reacted uniformly to the pressure of the ram. Although they introduced the rest period after the kneading process, they noted that it did not appear to have any important effect on the finished material. The small improvement in dough properties given by a 15 minutes' rest period can be obtained in another way, *e.g.* by increasing the extruding pressure. Harris and Knowles[28] suggest a few minutes' resting period.

Effects of Resting Period

Fifield, Smith, and Hayes[26] and other workers favour a resting period, and in their experimental technique dough is rested for 30 minutes even although they found that the length of the rest period did not appear to be important providing sufficient pressure was used in extruding. The temperature during the rest period was varied from 80°F. to 120°F. and appeared to have no significant effect on the colour of the product. They mention, however, that in the commercial process the tem-

perature of the dough during the rest period is considered by manufacturers to be of importance.

Martin *et al.*[42] have examined the effect of resting and of pressure during the resting period on the extrusion characteristics of the dough, and their work is discussed more fully later.

It is possible that during any rest period enzyme action may occur modifying the physical properties of the doughs or of the finished products, and these may be changed to varying extents with different semolinas during the rest period.

Enzyme Systems

Very little work has appeared on the differences between durum and vulgare wheats from the point of view of their enzyme systems. Since enzymes speed up chemical reactions to an enormous degree, certain reactions might be accomplished in a few minutes or hours in their presence. They remain unchanged at the end of the reaction, and raising the temperature increases their effect in a manner which grows progressively less as a certain optimum temperature is approached. As many of them are destroyed at high temperatures the optimum temperature is that at which the gain in speed of the reaction is just counterbalanced by the destruction of the enzyme. This is somewhat suggestive in view of the insistence of certain manufacturers upon strict temperature control during resting periods. There also exists certain optimum acidity or alkalinity conditions, and the enzymes can be "poisoned" or assisted by the presence of minute amounts of certain other compounds.

Properties of the Gluten

The properties of the gluten of durum wheats appear to differ from those of bread wheat glutens, and again the swelling capacity of durum wheat starches is greater than that of hard red spring wheat.[3] These differences may or may not extend to different durum wheats themselves and demand a suitable technique to obtain the best results. The rate of moisture interchange can vary between different wheats, and Fisher and Jones[43] have carried out some interesting work on this interchange in mixed wheats. When wheats of different moisture contents are mixed a rapid interchange of water occurs at first, but, however long the mixture is allowed to lie, exact equalisation of moisture never takes place, the damper of the two wheats remaining permanently slightly damper than the original drier wheat irrespective of whether the damper wheat is soft and starchy, such as English, or hard and vitreous, such as durum or Indian. Wheat, however, will absorb moisture at surprising speed, and the amount of moisture taken up by durum wheat in the first two hours is almost equal to that taken up in the next 22 hours. Durum wheats may absorb moisture from the air 20 per cent. faster than the soft starchy English wheat. The previous moisture content of the wheat, however, appears to be important, and the difficulty of getting water into hard durum or Indian wheats does not appear to be due to their hardness but to their dryness. From this it would appear, therefore, that the mixing and kneading times together are probably long enough to allow a good degree of water penetration and equalisation in the mix (although this has not been proved), but other factors may operate, rendering a rest period desirable in some cases and with some mixtures (*e.g.* durum and Manitoban hard winter wheat).

The mixer, open, showing dough and blades.
Leonard Hill photo.

Variations in Water Temperature

The temperature of the water can be varied, figures of 80°F. to 149°F. being given in the literature. Providing the water is not hot no particular advantage appears to have been recorded from the use of any particular temperature. It is of interest, however, that some manufacturers in the South American States are said to use boiling water, although it is difficult to see the advantage of this, and one would anticipate that such a procedure would result in a product with poor cooking properties, the gelatinised starch forming zones of weakness on cooking, while in the drying stage in manufacture it would be a likely centre of internal strains.

Fisher and Hines,[11] working on the rates of movement of water in wheat, obtained anomalous results by the method they employed, but they did conclude from their work that the previous moisture history of the wheat was most important in that it influenced the extent to which the wheat was traversed by minute pre-existing cracks, or the extent to which it would develop cracks when wetted, such cracks admitting the water into the interior of the berry. They found that the penetration of water in the early stages, *e.g.* up to 12 hours, is hastened materially by a higher temperature. It has not been demonstrated, however, that water absorbed from a liquid film covering the wheat passes through the berry at the same rate or in the

same manner as the water absorbed from a damp atmosphere. This question is an important one and will be discussed later when dealing with drying processes. It would appear dangerous to draw too close a parallel between the penetration of the wheat berry by moisture and that of semolina which has received a comparative severe physical treatment.

Temperature and Mixing Process

High mixing temperatures appear to be in common use in some German factories,[45] the water (to a 35 per cent. content) and semolina being mixed and maintained during mixing at 104° to 122°F. for fifteen minutes, followed by extrusion using a Buhler press of the normal type. The temperature of mixing is adjusted according to the quality of the gluten in the semolina, as judged by the Brabender or Berliner method, low quality gluten being treated at the lower temperature. In other factories[46] the semolina and water are mixed to give a dough of the same final percentage moisture as above, and this is fed to a mixing worm continuously, the paste being maintained at 148°F. for 35 minutes during the continuous mixing. Special importance is attached by the German technicians to the high temperature of the mixing, especially when flour alone is used in the paste.

(To be continued)

REFERENCES

[23] Fifield and Clark, *Mac. J.*, 1947, July.
[24] Hetherington and Smith, *Cer. Chem.*, 1943, **20**, 345.
[25] Le Clerc, *ibid.*, 1933, **10**, 1383.
[26] Fifield, Smith, and Hayes, *ibid.*, 1937, **14**, 661.
[27] Binnington and Geddes, *ibid.*, 1936, **13**, 497; 1937, **14**, 293.
[28] Harris and Knowles, *Mac. J.*, 1939; *Cer. Chem.*, 1940, **17**, 480.
[29] *Ibid.*, 1939, **16**, 384.
[30] *Ibid.*, 1939, **16**, 149.
[31] Cunningham and Anderson, *Can. J. Res.*, 1943, C.21, 265.
[32] Cunningham and Anderson, *Cer. Chem.*, 1943, **20**, 171.
[33] Cunningham and Anderson, *ibid.*, 1943, **20**, 482.
[34] Smith *et al.*, *ibid.*, 1946, **23**, 471.
[35] Sibbett and Harris, *ibid.*, 1946, **23**, 559.
[36] Irving and Winkler, *ibid.*, 1950, **27**, 205.
[37] Bergstrom and Holman, *Advances in Enzymology*, 1948, **8**, 425.
[38] Miller and Kummerow, *Cer. Chem.*, 1948, **25**, 391.
[39] Irving and Winkler, *ibid.*, 1951, **28**, 158.
[40] Irving and Anderson, *ibid.*, 1952, **29**, 65.
[41] Binnington and Geddes, *ibid.*, 1939, **16**, 149.
[42] Martin *et al.*, *ibid.*, 1946, **23**, 568.
[43] Fisher and Jones, *ibid.*, 1939, **16**, 573.
[44] Fisher and Hines, *ibid.*, 1939, **16**, 584.
[45] Hatchinson and Greer, BIOS Report, No. 575.
[46] Hoskins' "Food Industries," 1932, Feb., p. 48.

The photographs used in this article were taken in the factory of Green's Beatall Food Products.

Extermination of Rodents

DRY ice as a means of ridding food and other factory premises of rats has been used successfully in America.

If used in a meat plant, the area to be treated would first need to be emptied of all products and then sealed off, which should be sufficient to prevent mass air movement and can usually be accomplished by closing all doors, windows, and air ducting.

The area should then be given an initial charge of dry ice sufficient to give off a 20 per cent. carbon dioxide concentration. To hasten sublimation, the dry ice should be broken into pieces the size of marbles. A fan can be directed at the dry ice particles in dry storage rooms. The small pieces will sublimate in about ten minutes.

To be effective, the saturation should be maintained for at least 12 minutes.

Death comes to the rodents by suffocation. The carbon dioxide filters down into their burrows and forces them to the surface; there is thus no danger of *post mortem* food contamination. In addition, the saturation of dry ice gas leaves no residual effect on the building or equipment within the building. Except to change the air for the safety of employees, no cleaning up operations are necessary.

As a carbon dioxide saturated atmosphere from the dry ice can kill humans, regular oxygen masks with an oxygen canister must be used by operatives.

Industrial Drying

THE value to industry of efficient drying processes has grown in recent years with the great need for fuel saving. The exchange between those concerned of up-to-date information on drying problems can help to speed the use of methods of drying that may lead to improved efficiency and output.

A bibliography* now published covers the period 1924-50. Its 800 pages carry some 4,500 entries. The first two sections of the work, dealing with principles, processes, and equipment, include a limited number of references on heat transfer and drying of gases. A further three sections cover the various drying methods that can be used in agriculture, in the food processing industry, and in the drying of industrial materials. Each section is divided by subheadings under which the references are listed alphabetically.

* *Bibliography of Industrial Drying.* Pp. 802+xxxv. 3 vol. Department of Scientific and Industrial Research. Price £1 7s. 6d. (by post £1 8s. 7d.).

Fruit and Vegetable Utilisation

(*Continued from page* 368)

colour. To ensure complete sterilisation, they should then be washed with a dilute chlorine solution.

The foregoing deals with some of the manufacturing aspects of the report, which covers a very large amount of ground. The subjects of management and financial control; quick frozen fruits and vegetables; engineering; industrial engineering; buildings and services; research and scientific control; industrial relations; packaging and distribution are treated in their respective sections, and a valuable one containing 40 recommendations made by the team forms a synopsis of the most important points arising from their observations and conclusions.

TO AUTHORS

FOOD MANUFACTURE is prepared to consider the publication of articles on the subjects covered. Books on food would also be considered.

News from the Industry

An All-purpose Mixer

A new item of equipment — the Premier mixer — has been developed by Premier Colloid Mills. Of rigid construction, this unit combines low power consumption with efficient mixing which is achieved by the specially designed marine type propellers. The newly designed mixing head facilitates many chemical reactions not hitherto possible with propellers or paddles.

Twin Lift

Designed to elevate cases, cartons, crates, bales, and barrels from floor to floor, the Wedco twin lift, manufactured by The British Wedge Wire Co., requires only half the floor space required by a swing tray elevator. Operating between gravity roller conveyors, it will elevate approximately 720 articles per hour with a completely automatic feed and discharge.

It has a low feed height, a pit being unnecessary, and it can serve any number of floors with intermediate discharge. Feeding and discharging take place with perfect smoothness, while the provision of automatic cut-outs at both feed and discharge ends eliminates the danger of jamming. It can be supplied to discharge on the same side as the feed or on the opposite side.

Import and Shipping Services

A wide range of food products is imported by The British and Western European Trading Co., whose markets extend throughout the world.

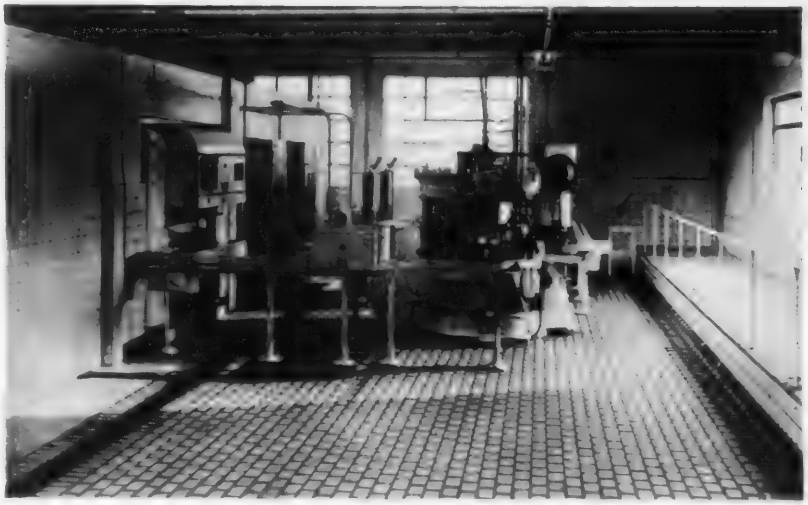
Among the commodities available are bottled and canned fruits and vegetables from the Continent; canned meats, including luncheon meats and hams, from the Commonwealth and Continent; and baked beans in tomato sauce, canned jams, salad cream, and other sundry lines from the Commonwealth and Ireland.

Included among the better known brands which are imported by the company are the Eliterna, Fruterna, Kouwenberg, and Confilux labels, but the larger majority of imports are now being made under their own Bawetco Brand.

Many new contacts have been made during the past year and fresh and attractive lines are continually being offered. Every effort is made to keep prices on as fair a basis as conditions will permit.

Axial Flow Fans

Axial flow fans are the subject of a recent publication issued by the Sturtevant Engineering Co.



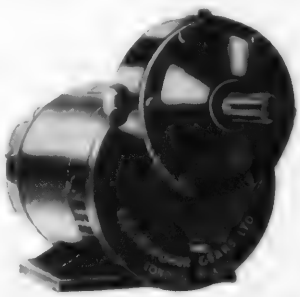
Acalor flooring installed at the Pepsi-Cola factory.

Chemical Resistant Floors

The food processing factory floor must be both acid and alkali resistant, must present a surface adequate to mechanical wear, such as trucking, that is easy to keep clean, and able to withstand the thermal shock of flooding with both hot and cold water, and must possess complete impermeability. A floor surface embodying all these latter physical qualities will, however, be valueless if it is subject to chemical attack that will in time lead to the break-up of the surface and acid penetration.

It has been found that the ideal floor is a good quality acid resistant tile jointed with a resinous cement that is both acid and alkali resistant, is unaffected by temperatures up to boiling point, and has a measure of resilience that will enable the jointed floor to withstand severe mechanical wear. Such a floor can be provided by the use of Acalor No. 9A acid and alkali resisting impermeable cement, in conjunction with suitable tiles. In cases where mechanical wear is such that even the best tiles are unsuitable, the same specification can be employed with cast iron perforated grids.

The laying of chemical resistant floors is only one facet of the work of Acalor, who offer a threefold service in acid corrosion.



An Electropower speed reducing unit.

A Gluten-enriched Brown Flour

Because of increasing demand for Procea brown bread, Procea Products have produced a gluten-enriched brown flour. In addition to gluten, salt and other ingredients are incorporated which, in time, will greatly simplify production of Procea brown bread.

Speed Reducing Units

Included in the range of spur gear boxes supplied by Electropower gears is a single reduction type, made in one size only, covering a range up to 1 h.p. maximum. The speed range, using 4-pole motors, is from 306 to 616 r.p.m. inclusive, with ratios from 2·31 : 1 to 4·65 : 1 inclusive. The gear box is fitted with large size ball bearings. It is a small, compact unit, and can also be mounted in any position, the motors in this case supporting the gear box. The gear box can be turned on the motor face to bring the output shaft below the centre line, or any intermediate position.

Another type manufactured by the company is identical to this latter unit except that it is flange mounting and lends itself ideally as a built-in unit. Such units are widely used when the mixing of materials or substances is essential. They can be fitted with multi-speed motors to give 2, 3, or 4 individual speeds, and are suitable for running in either direction.

Colt ventilation units are designed to slip easily into the roof in place of a piece of sheeting or pane of glass.

Ventilation in the Food Industry

In the manufacture and preparation of food, good atmospheric conditions with reasonable ambient temperatures and freedom from condensation must be maintained.

Unique systems of ventilation individually designed on the unit principle to meet the problems of ventilation encountered in each branch of the food industry are manufactured by Colt Ventilation.

Using specially designed ventilators, they are able to make the best use of natural resources, turning waste heat from the plant into a free source of useful energy for ventilation, so eliminating running and maintenance costs. The units of which the system is comprised are designed to slip easily into a roof in place of a piece of sheeting or a pane of glass—no reinforcement being necessary—so that a whole scheme can be installed economically with the minimum of interruption to production.

Education in Materials Handling

Two years ago a group of materials handling specialists started work on a plan to bridge a gap in the engineering studies of this country, namely, to provide complete courses of study in materials handling and the application of mechanical handling equipment, for production engineers and factory managers, and complete courses of study in the application and design of mechanical handling equipment for estimators, designers, and draughtsmen.

The committee stage of the work was completed some months ago, and the panel have now announced the formation of a school of materials handling for the immediate purpose of conducting private home study courses.

The courses are divided into three groups: for estimators, designers, and draughtsmen; for industrial executives, production engineers, and factory managers; and general courses. A fourth group of lessons is being prepared on power transmission, this being an integral part of mechanical handling.

Food Research and Advertising

In addition to the usual facilities, the Nevin D. Hirst Organisation make a special feature of marketing and public relations; in this respect they have recently carried out lengthy research in the food industry.

The services offered by the Organisation are available to large and medium sized advertisers throughout the country through either their London or Leeds offices, and as they have recently ceased, by mutual consent, to act as agents for Smedleys, the Organisation are now in a position to join up with food and allied product manufacturers who realise the importance of good advertising and of first-class experience of marketing to back it.

Dairy Fittings Cheaper

A revised price list for their range of stainless steel dairy fittings has been brought out by the Talbot Stead Tube Co., many of the new prices for component parts being as much as 25 to 35 per cent. cheaper. This reduction has been made possible by improved machining techniques, better working methods, and better utilisation of material.

Trade Effluents

A memorandum on the national policy on the discharge of trade effluents into public sewers has been issued by the Institute of Sewage Purification in view of the recent decision of Parliament to carry the improvement of legislation relating to the purity of rivers a stage further by the passing of the Rivers (Prevention of Pollution) Act, 1951.

Among the conclusions reached by the Institute are the following:

(*a*) That the objective of the Rivers (Prevention of Pollution) Act, 1951, of bringing about an improvement in the condition of rivers throughout the country can be readily achieved so far as the purification of domestic sewage is concerned, but that complete success will depend on proper treatment being applied to trade effluents from industrial sources.

(*b*) That the pollution of rivers by industry can be most effectively prevented by the discharge of all suitable trade effluent into public sewers for treatment at the sewage works, subject to certain safeguards.

(*c*) That if sewage works are to be operated at their maximum efficiency, and with the greatest economy, and are to give the best service to the manufacturer in providing treatment for trade effluents, it is most necessary that the whole of the effluents discharged into sewers should be under proper control, including those from factories which possess statutory rights for privileged discharges under the Public Health (Drainage of Trade Premises) Act, 1937.

(*d*) That under present conditions, many local authorities will be quite unable to comply with the standards of purity of sewage effluent which are likely to be required by River Boards under the 1951 Act because of statutory rights given to certain traders under the 1937 Act.

(*e*) That while it does not appear desirable that there should be any change in the present position of local authorities under the 1937 Act to decide their own policy in making charges to meet the cost of the treatment of trade effluent, yet on the other hand, there are certain advantages which may be gained in the combined interest of the authority and the trader by making charges on a sliding scale based on the volume and strength of the effluent discharged.

(*f*) That where charges are made for the treatment of trade effluent, the local authority should provide this service for the trader with payment of no more than the cost incurred.

(*g*) That national policy should be based on the achievement of justice and equity for all parties, not only between the local authority and the trader, but also between one trader and another; that when agreement is reached on what is a fair relationship between the trader and the community in the conditions ruling today, then all existing conditions of privileged discharges should be revised for the purpose of bringing them into line with those relating to new discharges, and that the 1937 Act should be amended to permit this accordingly.

Packaging Development

A transparent packing bag with latex sealing, developed by John Dickinson and Co., seals instantly simply by turning down the flap. This method of sealing saves time, money, capital expenditure, and maintenance charges.

As the use of water, paste, and heat is eliminated, this method of sealing commends itself particularly to the food industry.

Packing bags of this type are being used by Dawn Delicacies and Grafton Food Products.

Samples of the transparent packing bags with latex sealing.

Safety Guards for Machines

To be really efficient the machine guard should have several characteristics: it must fit snugly so as not to increase the space occupied by the machine it covers; it must be rigid, so that it cannot easily be forced inwards against moving parts; it must be easy to remove for repairs to the machinery, and to replace after the repairs have been done; oiling and servicing points on the machinery must always be readily accessible; the guard must be hygienic and easy to clean; and it must be safe to fulfil the requirements of the factory inspector.

To ensure satisfaction on all these points each machine must be treated as an individual unit, and each guard must be designed on the site. Machine guards of this nature are designed and made by the Light Engineering Department of Locomotors.

Killing Germs by U.V. Rays

A new development in ultra-violet mercury-vapour tube manufacture now makes it possible to reproduce the sun's germ killing action, at a very much lower cost than hitherto possible. The tubes are similar in shape to 15 W. or 30 W. fluorescent lamps. While this type of ultra-violet tube, which Philips now make of a special glass instead of quartz, emits germicidal radiation, it does not pass the rays which produce strong smelling ozone.

By using high ultra-violet intensities from specially designed reflectors concentrating the radiation from the tubes, bottles, tins, and jars used in the food and beverage industries can be sterilised or protected from airborne infection. This reduces the likelihood of the contents being spoilt and packaged foods can thus be stored very much longer.

One application which should find widespread use following its introduction in Holland is that of fitting the tubes in shop windows to protect meat, bacon, and other foods on open display from the large numbers of germs suspended in the air or carried by the dust always present in the atmosphere.

Laminated Plastic Trays

The confectionery manufacturers, Batger and Co., have recently re-equipped their sweet wrapping machines with Formica laminated plastic trays to replace the wooden surfaces formerly used in connexion with the making of their Silmos lollies.

When the lollies reach the wrapping machine, they are transferred by the operators' gloved hands on to a revolving wheel which carries them into the heart of the high-speed wrapping machine. Before use the tray is dusted down with powdered sugar to prevent the warm sweets from sticking to the surface and to each other.

Considerable gains in efficiency and output have resulted from the use of the laminated plastic made by Thomas De La Rue. When wooden trays were used, the wood graining under continual wear formed slight crevices which became clogged with the powdered sugar; this necessitated time-wasting scrubbing when cleaning. Moreover, in time the surface became uneven, making more difficult the movement of the sweets across the tray. Formica has overcome these disadvantages. It does not deteriorate, is easily cleaned, and its hard, smooth surface enables the operation to be done at maximum speed.

A sweet wrapping machine equipped with a Formica plastic tray.

Gift for Bakery Research

At the lunch given by the Baking Industries Research Association, Mr. A. G. Smith handed to Dr. R. T. Colgate, on behalf of the biscuit section of the Cake and Biscuit Alliance, a cheque for £2,300 towards the research expenses of the Association for the year 1952-53.

In acknowledging this generous gift, Dr. Colgate said how grateful he and the Council of the Association were for the donation. This was the second year in which the Alliance had made such a gift and he said how tremendously grateful they were, not only for the gift but also for the interest and confidence shown by the biscuit industry.

He looked forward to further opportunities of getting the industry together for the discussion of fundamental and production problems, on which the industry could advise them of its needs. Once new problems had been formulated the Research Association could work on their solution. The recognition of such problems would result in closer collaboration between the firms in the industry and the Association itself, a goal which should strenuously be sought.

OBITUARY

Mr. Charles Smith, the founder and managing director of Carltona, on June 30.

APPOINTMENTS

Mr. John Ryan.

At the Annual General Meeting of the British Standards Institution it was announced that the General Council had elected Mr. John Ryan, C.B.E., M.C., as its chairman to succeed Sir Roger Duncalfe, who had completed his three years' term of office.

In the course of the meeting, the Rt. Hon. Viscount Waverley, P.C., G.C.B., G.C.S.I., G.C.I.E., F.R.S., was re-elected President of the Institution for the third year. Sir Roger Duncalfe was elected Vice-President.

The new chairman, Mr. John Ryan, who is vice-chairman of The Metal Box Company, has for many years played a leading part in the standardisation policies implemented through B.S.I. by the packaging industry. He was appointed chairman of the Packaging Standards Committee on its formation in 1941, and was intimately concerned with the development of the war-time Packaging Code.

■

Mr. L. H. G. Barton, B.Sc., F.R.I.C., Honorary Secretary of the Food Group of the Society of Chemical Industry, has transferred from the Scientific Adviser's Division to the Canning Division of the Ministry of Food. In view of this change in his official duties, he has resigned his office of Honorary Secretary to the Group and is succeeded by Dr. H. Egan, who has been Assistant Honorary Secretary for the last two years.

■

Mr. M. K. Schwitzer, A.M.I. Chem. E., has been appointed manager of the Chemical Division, Europe, of Armour and Co.

The Chemical Division deals with the whole range of fatty acids and their derivatives produced by the company's new plant at McCook, Illinois, U.S.A.

Mr. Schwitzer is known to the industry for a number of scientific papers dealing with various aspects of the oils and fats industry, and particularly for his book "Continuous Processing of Fats" published by Leonard Hill, Ltd.

■

The following directors of firms in the food industry have recently been elected Fellows of the Institute of Directors: B. H. Challen (Challen Bros.), I. S. Duffus, A. O. Gill, Douglas W. Martin, and W. G. Spice (all of Gill and Duffus), E. A. Finch (The Service Food Co.), E. B. Harvey (United Yeast Co.), F. James Hawkes (Rajawella Produce Co.), J. Kerslake (Johnston-Carlton [London]), Wm. Latimer and W. Richardson (both of Rosehaugh Co.), James Muirhead (Frigidfruits), William Thyne (A. and R. Scott), W. D. Vernon (Spillers), Charles H. Webb, F.C.I.S. (Blaze, Allott and Co.), and W. P. Webster (Wrights Biscuits).

■

Mr. F. Graucob, managing director of Nu-Swift, has been elected chairman in place of Mr. A. Harland, who has resigned owing to advancing years. Mr. Harland has accepted the honorary post as President of the company. Mr. E. E. C. Cawood, M.B.E., general manager, has been appointed technical director.

■

Mr. R. W. J. Rowledge has been appointed assistant managing director of The United Glass Bottle Manufacturers.

■

Mr. Brian H. Turpin, technical and sales director of Quickfit and Quartz, has been elected a member of the Stone Urban District Council.

■

Gordon and Martin, Manchester, are now officially representing the Spicer Food Co. in the north-west area of England.

Seventy Years' Service Celebration

On July 16, the chairman and directors of W. J. Bush and Co. gave a dinner to Mr. W. J. Thomas, chairman of W. J. Bush and Co. (Aust.) Pty., and a director of the parent company, in honour of his 70 years' service with the company. During the dinner a souvenir of the occasion was presented to Mr. Thomas by the chairman, Dr. P. C. C. Isherwood, O.B.E., Ph.D., F.R.I.C.

It was on June 25, 1882, that Mr. Thomas entered the employment of Bush as an office boy and, within 10 years, he had proceeded to Melbourne to become the Australian branch manager. In 1937 he was appointed director of the English company and in 1949 became chairman of directors of the re-formed organisation in Australia.

Present at the dinner were: Dr. P. C. C. Isherwood (chairman) and Mrs. Isherwood; Mr. H. B. Bush; Mr. and Mrs. E. L. Bush; Mr. C. F. Bush; Mr. and Mrs. A. J. McIntyre; the general sales manager, Mr. C. R. Woods, and Mrs. Woods; the manager of the Australian Department, Mr. E. C. Sortwell, and Mrs. Sortwell; and Mr. Thomas's daughter, Mrs. A. Sheldon.

Erections and Extensions

Extension of their bakery at Coast Road, Newcastle-on-Tyne, is being carried out by Lees Bakeries.

■

A new £20,000 bacon curing factory is to be established in the new town of East Kilbride by J. and W. Galloway. They will adapt existing buildings and add new premises to make a modern factory north of the new town. The Development Corporation has approved the new plant which will employ some 50 workers to start with, building up to about 100 in due course

■

The foundation stone for a new edible oil refinery has been laid at the Stork Margarine Works of Van den Berghs and Jurgens, Bromborough.

The new refinery will increase the Bromborough work's potential output by 50 per cent., including bakery margarines and shortenings of Craigmillar and British Creameries.

Inhabitants of countries providing the raw materials of margarine bring samples of their products to put in the foundation stone of the new Bromborough refinery. Right to left are representatives of Turkey with sunflower seeds; Sierra Leone with palm fruit and palm kernel; Sudan with seed; Manchuria with soya beans; Indonesia with coconut; and Northern Nigeria with groundnuts. At the back are Harry Collinson bringing milk, Barbara Podmore with the finished product, and Ernest Nightingale, the company's chief chemist.

BRITISH STANDARDS

Electroplated Coatings of Tin

A further publication in the series which is being prepared covering electroplated coatings of various metals has been issued by The British Standards Institution.

The present document deals with electroplated coatings of tin. It provides for the coating of this metal on fabricated articles of iron, steel, copper, and copper alloys and covers five classes of coating according to the use to which the coating is to be put. It also provides details of samplings, finish, solderability, thickness, adhesion, and heat treatment, together with the necessary methods of test.

▪

Packages for Frozen Food

In Britain, the quick freezing method of preserving foodstuffs is still comparatively new and the processors continue to experiment with different sizes of pack. Consequently, a large number of sizes has already been introduced and it is recognised, in the interests of economical use of storage space, that a reduction in the number of sizes is desirable.

For this reason, a British Standard has been prepared listing sizes and the method of designating them. In view of the early stage of development in the industry, it is recognised that an early revision of this standard may have to be undertaken; this will be done as soon as it becomes necessary.

▪

Milk Piping and Fittings

For some years many sections of the dairy industry have felt the need for the standardisation of milk pipe and milk pipe fittings. The Society of Dairy Technology therefore requested the British Standards Institution to prepare such a standard and provided a technical memorandum which has been of considerable assistance to the committee responsible for the work.

The Institution have now issued B.S. 1864, "Milk piping and milk pipe fittings" covering milk pipes of stainless steel and tinned copper together with milk pipe fittings of stainless steel, tinned bronze, and tinned gun-metal. The fittings are of the compressible ring joint type.

After full consideration of the alternatives the compressible ring joint design has been adopted. The dimensional standards permit the use of both stainless steel and tinned copper in the same installation but it has not been possible to arrange permissible tolerances to ensure that a tinned gun-metal fitting will fit any sample of stainless steel pipe without slight enlargement of the recess bore.

It has not been possible to include any device to restrict the movement of the nut along a length of pipe when uncoupled. The necessity for this can, however, be avoided to some extent by fitting pipes with male parts whenever possible.

This British Standard covers the following five nominal outside diameters—1, 1¼, 2, 2½, and 3 in. For pipes it specifies details of material, dimensions and tolerances, manufacture, and finish. For the fittings it specifies details of the material, dimensions, and tolerances, ring joints, finish, and threads and includes details or symbols to indicate various joints, unions, bends, etc.

Tables are included giving exact dimensions for the various parts together with the necessary tolerances. Appendices include a specification for rubber rings to be used in the joints.

The standard does not include special fittings forming part of process equipment such as cocks for tanks or pipe connexions, but recognises that such fittings should comply with the material specification and the leading dimensions given in the specification.

▪

Chemical Analysis of Butter

A first revision of B.S. 769, "Methods for the chemical analysis of butter," has been issued by the British Standards Institution. This document was first issued in 1938 and has now been brought up to date by specifying improved methods for the determination of curd and salt, titratable acidity, iron, and copper.

It also includes revised methods for the determination of the constants of butterfat, *viz.* volatile acids, iodine value, saponification value, and refractive index. These methods have been approved by the British Standards Institution through its British National Committee on soaps and fats of the International Commission for the study of fats.

Additionally, the document includes methods for the preparation of the sample for the determination of moisture, salt, curd, fat, and hydrogen-ion concentration of curd serum.

Raspberry Transport

A first experiment in transportation of raspberries from mid-Scotland to the London market has proved rather less successful than anticipated, but further work will be done when improved packaging has been devised. Broken punnets and spilled berries made the first shipment less suitable for marketing than expected. Work is now directed to securing a better type of container to improve packaging. The raspberries were conveyed south by insulated vans and the hope is that further shipments will be sent when these problems have been overcome.

Rural Domestic Economy

The Berkshire Education Committee has recently established a Rural Domestic Economy Centre at Marcham Park, near Abingdon, to demonstrate the production and utilisation of home-produced food.

The Centre is equipped with a demonstration kitchen, furnished for 12-15 pupils, a model home kitchen, and a preservation kitchen.

The model home kitchen is fitted with an electric cooker and a convector heater, both of G.E.C. manufacture.

G.M.S. Prices Reduced

Despite increases in raw material cost, the new prices of Admul glyceryl monostearate made by Advita are the lowest since September, 1950.

The revised prices are:

	Per lb.
1 ton and over	2s. 4d.
5 cwt. to 1 ton	2s. 6d.
1 cwt. to 5 cwt.	2s. 8d.
Less than 1 cwt. ..	2s. 10d.

Up to now there have been two prices for quantities up to 1 cwt.—one for weights between 28 lb. and 1 cwt., and another for quantities up to 28 lb. These two items have now been combined and the introduction of a flat rate for any amount up to 1 cwt. will help the small user.

Greatly increased sales have made it possible to reduce production costs. Production has also been increased to meet the rising demand. In addition to the Bromborough factory, an ancillary plant at Gainsborough has been brought into operation within the last two months and this will give a still greater potential for future sales.

Surgical Dressings

The dangers of contamination by cut hands and fingers during the various phases of preparation, processing, and packing of food have been successfully combated by insisting that such injuries are adequately covered and immunised from contact with materials. This has been made possible with the advent of the filmic dressing as developed by Dalmas Ltd. The dressing is strong, smooth, waterproof, fully antiseptic, and so supple that it conforms to every stretch and movement of the affected limb, at the same time providing a completely occlusive seal. It makes bacterial contagion impossible, and is impervious to oils, greases, acids, and gaseous atmospheres. For work where the tips of fingers are prone to injury, there is a special Dalmas dressing which gives absolute protection. Cuts are given the opportunity to heal without disturbing the epithelial embryo through rubbing or abrasion. The dressing is not affected by immersion in water.

BOOKLETS RECEIVED

A checklist of iodine compounds and preparations has been published by the Chilean Iodine Educational Bureau (Pp. 78, price 2s. 6d.).

*

An illustrated history and survey of the Polak and Schwarz organisation since its inception 1889 at Zutphen, Holland, has been published by the parent company in Holland.

*

The 1952 issue of the *F.M.S. Bulletin* has been increased in size. From its 128 pages, which are divided into three chapters dealing with F.M.S. from farm to farm, F.M.S. from farm to table, and F.M.S. overseas, will be gleaned the wide range of activities carried on by the company, who are to be congratulated on the excellence of this year's publication.

*

The advantages of outdoor advertising and the facilities offered by A. W. Newton are fully described and illustrated in an attractive book which has been produced by the company. The media of outdoor advertising dealt with cover billposting, vehicular advertising, London Underground, main line railway advertising, and electric signs.

COMPANY NEWS

Subject to the completion of the audits of the accounts of the company and its subsidiaries, the consolidated trading profits of the Beecham Group for the year ended March 31, 1952, amount to £2,605,058, as compared with £2,735,077 for the previous year.

After providing for taxation, dividends to preference and other outside shareholders, and redemption of preference shares in subsidiaries there remains a balance of £887,341.

Of this amount, net dividends totalling £140,437 have been paid on the 10 per cent. cumulative preferred and 4½ per cent. redeemable cumulative preference shares of the company, leaving a surplus of £746,904 available for the deferred shares and reserves. Interim dividends aggregating 36 per cent. (actual) less tax and taking £285,863 have already been paid on the deferred shares and the directors now recommend the payment of a final dividend for the year on the deferred shares (including the 2,700,000 new deferred shares issued in April, 1952) of 4 per cent. (actual) less tax, taking a further £38,850. The total distribution on the deferred shares is therefore at the same rate as for the previous year. The above surplus has therefore been allocated as to £324,713 in dividends on the deferred shares and £422,191 to reserves.

The final dividend on the deferred shares, now recommended, will be declared at the Annual General Meeting to be held on September 24, 1952, and paid on October 1, 1952.

*

At the fifty-fifth annual general meeting of Bovril, the Rt. Hon. Lord Luke, chairman, in his address to the shareholders said that on an overall review of the result of the activities of the Bovril group of companies during the past year, it would be seen that their figures could be considered satisfactory. Most of their enterprises had been successful during the year, but they had had disappointments in America and Australia.

Satisfactory progress had been made at their factory in Northern Ireland, and in addition to their other milk products, the manufacture of cheese had been commenced during the current year. During the year they had also placed on the market a new type of baby weaning food in cube form which had been well received.

Argentine Estates of Bovril was still playing its part in the development of Argentina by maintaining its estancias, breeding up cattle stocks, and by giving employment to some 3,000 Argentines both on the land and in their factory at Santa Elena, where their meat products were prepared for export at as high a production level as possible, the only limiting factor being shortage of tinplate and other packaging materials.

Lord Luke also referred to the termination of their projected meatworks at Katherine, in the Northern Territory, Australia. This would mean the loss of much of the capital which had been invested in buildings, although most of the plant and equipment was saleable in Australia.

The payment of a final dividend on the deferred stock of 10 per cent., making 12½ per cent. for the year, was recommended, leaving an increase in the amount to be carried forward of £13,118 at £225,762.

*

As in the past two years, the directors of Allied Bakeries Ltd. have decided to deal with the total ordinary dividend for the 52 weeks to March 29, 1952, without awaiting the full trading results. At a board meeting held in July, there was declared a third interim ordinary dividend of 10 per cent. actual, less income tax, payable on August 30, 1952, making with the first and second interims of 10 per cent. each, a total of 30 per cent. for the period.

The directors are satisfied that when audited accounts are available towards the end of 1952 they will show a continued increase over the earnings of previous periods and the directors will then make a decision as to the appropriation of these profits.

OBITER DICTA

- What a twee word "elevenses" is. Can't we think of something better?—*Amy Landreth, "Daily Graphic."*
- You cannot be happy in Britain unless you drink large quantities of tea.—*Senhor Moniz de Aragao, retiring Brazilian Ambassador.*
- The quantity and quality of England's meat is hopeless. I do not know whether it was horse, cattle, or whale, but it was all awful.—*Mayor of Auckland, New Zealand.*
- It takes two and a half gallons of milk to make a pound of butter, and the cost of manufacture in this country is 6s. to 7s. a pound.—*Dr. Charles Hill, M.P.*
- Fish and chips is without doubt the perfect balanced meal, whether eaten from a newspaper or on a plate. It has all the protein, carbohydrate, and fat content one needs.—*Mr. George Bleier.*
- The sausage has usurped the place of honour of the Englishman's table formerly held by sirloin, and the only consolation is that the creature is easier to carve.—*Dr. Broughton, M.P.*
- Are ice cream and chocolates sufficient for cinema audiences? How, for instance, would you like to have "frozen custard" with your Clark Gable? Or "candy floss" with your Van Johnson?—*"Daily Record and Mail."*
- Dr. Hill, the Parliamentary Secretary to the Ministry of Food, worked himself into a state of homicidal excitement during the election, but now that he occupies a position of more responsibility and less freedom, he is cultivating a bedside manner, indeed almost a graveside manner.—*Mr. E. Shinwell, M.P.*
- When we tin pears we do more than preserve them—we improve them. For nothing as nice as a tinned pear ever came out of an orchard. The only other food that improves in the tin is salmon. Tinned salmon has a fine flavour, but fresh salmon has no flavour and has to borrow from cucumber and mayonnaise. — *John D. Sheridan, "Irish Independent."*

World Food News

FORTHCOMING EVENTS

Course in Bakery Sanitation

The American Institute of Baking will hold a special course in Bakery Sanitation at its new building in Chicago from September 19 to 22, 1952.

Symposium on Fat Chemistry

The fourth post-war Annual General Meeting and Symposium of the *Deutsche Gesellschaft für Fettwissenschaft* (D.G.F. for short) will be held in Düsseldorf from October 5 to 9, 1952.

The D.G.F. was formed in 1935 as the successor to the *Wizöff*, the latter being well known as the organisation responsible for the compilation and publication of standard methods for the fat industry.

Chocolate Crumb from Surplus Milk

Chocolate crumb factories in Dublin and Kerry have had to introduce overtime work in order to absorb an unexpectedly big increase in the summer milk yields from Irish cows.

The Dublin Milk Board appealed to the managements as the milk would otherwise have been wasted. Sunday work was introduced to cope with the increase.

The Urney chocolate factory in Dublin processed about 8,000 gallons of the surplus milk in two six-hour shifts.

Research at the Mellon Institute

The work of the specialists of the Multiple Fellowship (Food Varieties) of H. J. Heinz is described in the Research Proceedings of the Mellon Institute for 1951-1952. In the studies on the evaluation of thickening agents, definite progress was indicated in characterising the pasting and other physical properties of various thickening agents suitable for use in canned foods.

The discoloration of glass-packed foods in the form of purée has remained an important laboratory problem. From the data now available, it appears probable that such discoloration is an oxidising effect catalysed by small traces of iron and that the oxygen needed for this reaction is derived in part from occluded air or air leakage, owing to imperfect glass closures. With improvement in the efficiency of the gasket in the lids for such containers, ingress of outside air into the containers can be prevented. Experimental packs of this type have remained free from discoloration for well over a year.

The Bread Fellowship, sustained by H. A. Kohman, has made efforts to produce salt-rising bread with more pronounced flavour and aroma characteristics. It is the Fellowship's opinion that the flavour and aroma of salt-rising bread are primarily due to the acid by-products of a symbiotic fermentation of two bacteria, *Clostridium welchii* and *Clostridium tertium*. If any alteration has occurred in the bread, it is probably attributable to some subtle change in the bacteria, possibly in their numerical ratio to each other.

The principal project of the Multiple Fellowship (Soybean) of the J. R. Short Milling Co. resulted from a completely new concept of soya bean technology. Work now in progress involves the fundamental study of processing techniques designed to effect further fractionation of the valuable constituents of the soya bean, whereby new oils, proteins, biologicals, etc., can be economically produced.

Electrostatic Grain Cleaner

The American Quaker Oats Company is now producing by electrostatic separation what is claimed to be the world's cleanest corn.

The electrostatic cleaning machines consist of grounded conveying rolls over which grain is passed, and electrodes charged with 30,000 volts. As the grain enters this electrostatic field, corn and impurities are separated, their differing electrical charges deflecting them into bins. In actual operation the grain is first passed through electrostatic fields and then through aspirating, particle size, and gravity separators to remove any remaining non-conductive particles. It is then re-circulated through several more electrostatic fields before being washed for processing. It is claimed that electrostatic separation removes foreign matter and microscopic impurities which even the best combinations of cleaning have failed previously to eliminate.

The electrostatic grain cleaner used by the Quaker Oats Co., of America.

New Tasmanian Apple Variety

In the last two seasons, unfavourable weather and a decline in acreage has caused Tasmanian apple production to fall from the average of 6,000,000 bushels to 4,000,000 bushels. The 1951 crop was worth more than A£4,000,000. The United Kingdom has for years been Tasmania's best customer, but since the last war large quantities of apples have also been shipped to Europe and Asia.

A new apple variety called Apex has been produced there. It is like the Democrat in size and colour and has the early ripening qualities of the Worcester. It matures immediately after Worcester and is ready for marketing before Jonathan. The variety was first grown on Democrat seedlings by natural pollination from a block of Worcester.

Permanent Working Party Formed

The eleven nations which comprised the temporary FAO Working Party on Mediterranean pasture and fodder development have decided to become a permanent Working Party in order to carry on more effectively the programme for improving grassland and fodder production in the Mediterranean area. It was agreed that FAO would co-ordinate this research and send seeds of legumes, grasses, and forage crops to interested countries for experimental plantings this autumn. These decisions were made at the first meeting of the Working Party.

The Working Party decided to hold its 1953 meeting in Algeria. In the meantime, member countries will investigate and report on management and improvement of pastures and natural grasslands, seed production and testing of promising species. FAO will compile a list of institutes and grassland specialists in the Mediterranean area and a classified list of the major grassland problems and the locations especially suitable for their study. Crop rotations with grasses and legumes for food production and soil improvement will be investigated, and the carrying capacities of natural grassland will be surveyed.

Considerable interest was shown in the display of equipment exhibited at the Canadian International Trade Fair by Autopack, particularly in the fully automatic Autopackers, cartoning machines, and sachet making machines.

Trade Fair in Canada

The Canadian International Trade Fair opened on June 2, for the fifth year in succession. Dr. J. R. M. Van den Brink, Netherlands Minister of Economic Affairs, officially declared it open at a ceremony presided over by the Rt. Hon. C. D. Howe, Canada's Minister of Trade and Commerce.

Exhibitors from 30 countries displayed a very large range of goods.

OVERSEAS ENQUIRIES

Cocoa and Fruit Products

The Compania Inter-Regional de Comercio S.A., of Calle Moral 105, Arequipa, Peru, wish to receive particulars of and quotations for cocoa in tins, and canned jams, marmalades, fruits, etc.

United Kingdom firms who are interested in this enquiry should communicate direct with the company at the address given above.

■

Frozen Fish

Messrs. Chester Moore and Sons, 318, Cadiz Street, Dallas, are interested in receiving supplies of frozen fish. Quotations for shipments to Houston under refrigeration are required for cod, haddock, flounder, ocean cat fish, and perch.

If exporters do not normally ship to Houston, the company will be glad to know to which gulf ports refrigerated shipments are sent by United Kingdom firms.

Consignments should be packed as follows:

(*a*) 8 or 10×5 lb. cartons in master cases, cellulose wrapped.

(*b*) 5×10 lb. cartons in master cases, cellulose wrapped.

(*c*) 12 or 24×1 lb. cartons in master cases, cellulose wrapped.

(*d*) Layer packed, not required to be cellulose wrapped.

All the above mentioned varieties of fish are required skinless with the exception of perch, which can be shipped with the skin on or off.

Interested firms should submit quotations direct to the company in dollars c.i.f. port of entry, giving full details and some information as to availability of supplies and frequency of deliveries.

Firms are reminded that the products mentioned are subject to the U.S. Food and Drug Administration regulations.

■

Oil Extraction Plant

Baleasa S.A. Pte. Franco 380, Ascuncion, Paraguay, require plant for setting up a factory for extracting oil from coconuts, peanuts, and sunflower and castor seeds.

Any United Kingdom firms able to supply suitable equipment should send full particulars of their machines with trade literature, delivery dates, and prices direct to the enquirers at the above address.

■

Biscuits for U.S.A.

The Rath Cigar Company, 419, Second Avenue, Seattle, Washington, are interested in receiving offers from United Kingdom manufacturers of biscuits packed in attractive one pound tins.

Any firms interested in this enquiry should communicate direct with Mr. A. Rath giving quotations in dollars c.i.f. Seattle, and delivery dates. In view of the short time available before Christmas, samples should accompany offers. United Kingdom firms are reminded that biscuits are subject to the U.S. Food and Drug Administration regulations.

■

Food Plant and Containers

Industria S.A. Industrial and Technical Installations of 9, Clisthenis Street, Athens, are interested in acting as agents for United Kingdom manufacturers of plant for the food industry, for making metal containers, and for edible oil refining.

United Kingdom firms who are interested in this enquiry should send full details of their machines direct to the company with prices, delivery dates, and trade literature.

■

Foodstuffs and Glassware

Messrs. Sucesores de Juan Passano S.A., "La Tienda," Calle Santo Domingo 134 (Casilla 556), Arequipa, Peru, are interested in receiving particulars and quotations from United Kingdom exporters who are not represented in Peru, of confectionery, biscuits, canned jams, marmalades, fruits, vegetables, etc., Indian tea, and glassware of medium quality for table use.

United Kingdom firms who are interested in this enquiry should reply direct to the Peruvian firm.

Food Processing Machinery

The Greene-Todd Co. Inc., 125, 4th Avenue N., Seattle, Washington, are interested in receiving details of mixing machinery, including dough mixers of 20, 30, 60, and 80 quart capacity; chopping machines; and power-driven slicing machines, for operation from standard U.S. supply of 110 volts A.C. 50-60 cycles.

It is suggested that any United Kingdom firms who are interested in this enquiry should send full details of any equipment they are able to offer with dollar quotations c.i.f. Seattle and a statement concerning deliveries direct to the Greene-Todd Co. Inc.

A New Food Container

The Alu-Cup container, produced from aluminium foil in any size up to 3½ oz. content, is being manufactured by Andersen Bruun's Fabriken A/S, Denmark. Sealed by an aluminium foil lid, the container is also manufactured in Britain, and is being used for packaging cheese and ice cream. It can also be used for fruit, jellies, liver paste, sandwich spread, and meat extract.

News from the Ministries

Appointment

Mr. H. Pitchforth has been appointed Principal Private Secretary to the Minister of Food with effect from August 9, 1952, in succession to Mr. F. A. Bishop, who is being transferred to other duties in the Ministry on promotion to Assistant Secretary.

Coronation Souvenir Tins

The Board of Trade are prepared to consider applications for licences under the Containers and Packaging Orders for the packing and distribution of Coronation Souvenir tins. This applies to Coronation Souvenir tins for the home market since there is no restriction on tins for export.

Applications should be made to the Board of Trade, Dept. IM5, Horse Guards Avenue, Whitehall, S.W.1. The applicant should give details of the commodity to be packed and the name and address of the tin maker who is prepared to accept the order, together with an undertaking that the tins will be suitable for retention as Coronation Souvenirs.

Revised Standard for Ice Cream

In order to avoid a reduction in the supply of ice cream, it has become necessary to modify the standard for ice cream which was introduced in March, 1951.

Milk powder and fats cannot be allocated to ice cream manufacturers at the same rate as in 1951 because of the current shortage. If the original standards were maintained there would be a fall in supplies of ice cream. It was accordingly decided to reduce the minimum fat content of ice cream from 5 per cent. to 4 per cent. and the minimum non-fat milk solids content from 7½ per cent. to 5 per cent. with effect from July 7, 1952.

For ice cream containing fruit, fruit pulp, or fruit purée, a consequential reduction from 7½ per cent. to 6 per cent. was made in the fat content and from 25 per cent. to 21 per cent. in the total content of fat, sugar, and non-fat milk solids. Similarly, the fat content of Parev (Kosher) ice has been reduced from 10 per cent. to 8 per cent. These changes also became effective on July 7, 1952.

Egg Products

The Egg Products (Control and Maximum Prices) Order, 1946, has been amended so as to increase, as from July 12, the maximum selling prices of frozen whole egg, frozen white of egg, and frozen yolks.

Publicity Working Party

A small Working Party has been appointed by the Minister of Agriculture and Fisheries to advise on publicity for the Government's new food production drive.

It will be under the chairmanship of Sir Richard Haddon, C.B.E., and the other members are Messrs. F. Hartop, Henry Martin, F.S.A., F.R.S.A., A. R. N. Roberts, Fred Scott, and F. H. W. Swallow.

Meat Supplies

On July 20, the allowances of meat for manufacturing purposes were increased as follows:

Group I (large manufacturers—from 45 per cent. to 60 per cent. of basic use.

Group II (general butchers)—the allowance will remain at 3½ per cent. of the value of each butcher's permit, but the value of the permit will be increased as a result of the increase of the ration.

Group III (small manufacturers and cooked meat shops)—from 40 per cent. to 50 per cent. of basic use.

Group IV (pork butchers)—from 55 per cent. to 70 per cent. of basic use.

Director of Bacon and Ham Division

Mr. P. S. Hall, C.M.G., C.B.E., director of the Bacon and Ham Division in the Ministry of Food, has resigned. In response to the Minister's request, Mr. Hall has agreed to act as Adviser to the Division and to continue to give his full-time services to the Ministry. The Minister has expressed his appreciation of the services which Mr. Hall has rendered to the Ministry since he first joined it in 1940.

Mr. Alec Warren, C.M.G., was appointed to succeed Mr. Hall as director of the Bacon and Ham Division with effect from August 5, 1952. For the present, Mr. Warren will continue to act as Wholesale Adviser to the Ministry and as director of the Canned Fish, Fruit and Vegetables Division.

Commonwealth Gift Centre Closes

H.M. Government in the United Kingdom announce that it has been decided to close the Commonwealth Gift Centre which was set up (under a different name) in the Ministry of Food in 1942 for the purpose of distributing, with the help of local authorities, schools, and many national organisations, the large quantity of food which was being sent in bulk to the Ministry by generous donors all over the world.

The Commonwealth Gift Centre will close on October 31, 1952, and after that date the Ministry of Food will no longer be able to receive bulk gifts for general distribution or pay the charges which it has hitherto borne, *viz.* cost of sea freight and inland carriage to the point of distribution.

It is emphasised that this decision affects only food gifts which have been received in bulk in the United Kingdom, the distribution of which has been the responsibility of the Ministry of Food. H.M. Government do not in any way wish to discourage the considerable and generous flow of parcels being sent direct to individual recipients from individual donors overseas.

Approved Crop Protection Products

A new list of officially approved crop protection products — insecticides, fungicides and weed-killers—has just been issued.

The voluntary approved scheme started in 1942, with the main object of giving guidance to the grower in the purchase of his crop protection materials. Approval is granted in respect of products which comply with the standards of composition and performance approved by the Ministry of Agriculture and Fisheries and the Department of Agriculture for Scotland for the purpose stated on the containers.

The 1952 list can be obtained free from the Ministry of Agriculture (Publications), 36-38, Chester Terrace, Regent's Park, London, N.W.1.

Sugar for Bees

Beekeepers may obtain a maximum allowance of 10 lb. of sugar for each colony between August 2, 1952, and January 31, 1953. This allowance, together with the stores of honey which beekeepers should leave in the hives at the end of the season, is for winter feeding.

An additional maximum allowance of 5 lb. of sugar for each colony for spring feeding will be made available between February 2, 1953, and June 27, 1953. Beekeepers may, if they wish, draw the winter and spring allowances together at any time between August 2, 1952, and June 27, 1953.

Application for permits must be made on the official form obtainable at local food offices.

Imports of Dried Chicory Root

The import of a limited quantity of dried chicory root will be permitted under specific licence during the period July, 1952, to June, 1953.

Prices of Fat Pigs

A new price schedule for fat pigs was to be introduced on June 23, 1952, in which the prices for pigs weighing over 10 score lb. deadweight would be reduced.

At the present time there are widespread restrictions on the movement of pigs owing to outbreaks of foot and mouth disease in many parts of the country. The Ministry of Food and the Agricultural Departments, in agreement with the Farmers' Unions, have therefore decided that the introduction of the new price schedule for fat pigs shall be postponed until further notice and that the interim price schedule which came into effect on April 28, 1952, shall continue in force. At least three weeks' notice will be given to pig producers before the introduction of the new schedule.

Changes in Export Licensing Control

Changes in export licensing control are made by a Board of Trade Order which came into operation on August 11, 1952.

The principal changes are as follows:

1. The export of all goods to Tibet is prohibited except under licence.
2. Licences are now required for all destinations for certain mixtures of spirits, rare earth metals, alloys, compounds and mixtures, specified forms of aluminium and titanium (rutile).
3. Licences are now required for nickel catalysts, for all destinations other than those specified in Part II of the Third Schedule of the Order excluding Hong Kong.
4. Fruit pectin, certain preserves and jellies, specified railway and tramway material and cotton yarns and unfinished thread, are now exempt from export licensing control.

White Fish Subsidy

As announced in Parliament on July 24, the subsidy to catchers of white fish in the inshore, near, and middle waters, which was due to end on July 31, is to be continued as a further temporary measure until March 31, 1953. As heretofore, the subsidy will not be payable in respect of vessels of 140 ft. and over. There will be two minor changes in the scales of payment for vessels over 70 ft. in length, *viz.* (*a*) the introduction of special scales for motor vessels of over 70 ft. but under 90 ft. in length which make voyages to Faroe grounds; and (*b*) an increased voyage maximum in respect of steam vessels of 110 ft. and over but under 120 ft. in length. The rates to inshore fishermen using boats not exceeding 70 ft. will remain at 10d. per stone for fish sold otherwise than by retail, reduced to 8d. per stone for most varieties if the fish is landed ungutted.

A condition attached to the payment of the subsidy is that statements of account for the year 1952 will be submitted on lines similar to those required for 1951. The statements of account to be rendered by owners of vessels fishing in the near and middle waters, showing the financial results of the operation of their vessels in 1952, will require to be furnished to the Ministry of Agriculture and Fisheries or the Scottish Home Department, as the case may be, not later than February 16 next.

The full conditions, with scales of payment and instructions for making claims, are set out in an explanatory leaflet WFS. 1, copies of which can be obtained from any District Fishery Office in England and Wales or at any Fishery Office in Scotland.

The A.B.C. of Preserving

A revised edition of the "A.B.C. of Preserving" (H.M.S.O., price 1s. 6d.) has been prepared by the Ministry of Food (in collaboration with the Ministry of Agriculture and Fisheries) and the Central Office of Information.

This booklet, which was first issued in November, 1949, gives instructions for the home preservation of fruit, vegetables, herbs, and nuts and will be of particular help to beginners with little knowledge of food preservation, as well as giving much useful information to housewives and trained cooks. The new edition contains a revised section on the oven method of bottling fruit, additional information about making chutneys and sauces, new sections about sauerkraut and mint sauce for winter use, interesting charts on fruit processing and canning, and a special section on preserving by drying. The booklet is illustrated throughout.

Increased Quota for Fruit Pulp

On April 15 the Board of Trade announced that a quota of £1,000,000 had been fixed for imports in the period July 1, 1952, to June 30, 1953, of fruit pulp other than apricot, grapefruit, peach, pear, and pineapple.

A comprehensive quota for all fruit pulps has now been fixed at £1,250,000, of which £500,000 will be for the five special varieties and £750,000 for other fruit pulp.

Licences to a total value of £1,000,000 have already been issued, and additional licences to a value of £250,000 will be issued shortly. Like those already issued, the additional licences will be issued separately for the special varieties and for the other fruit pulps. Importers need not apply for these additional licences, which will be issued against the applications already submitted.

Dried Plums and Prunes

To facilitate the experimental drying of plums from the exceptionally heavy crop expected this year, the Ministry of Food announces that price control will be removed from dried plums and prunes from September 1. The cost of drying homegrown plums, by adapting a variety of existing plant, cannot well be assessed in advance, and it is hoped that experiment may be facilitated if it is known that the product can be sold free of the present price restriction.

The necessary amending Order will be made in due course.

The Ministry has no imported prunes in stock at present and no further supplies can become available for distribution before March, 1953, at earliest.

Bread Subsidy for Scotland

The rate of subsidy payable in Scotland from November 4, 1951, has been agreed at 8s. 0½d. per sack. This is in accordance with the recent decision to adjust the rate of subsidy from the end of the costed period on which the adjustment is based, and at the same time to discontinue the adjustment for "trends." The rate of 8s. 0½d. represents an increase of 1s. 5d. per sack on the previous rate inclusive of "trends."

The rate is reduced to 7s. 6d. from December 2 in accordance with the decision to exclude from subsidy costings from that date the net additional cost of sending bread to the area north and west of the Caledonian Canal, the Inner and Outer Hebrides, and the Counties of Orkney and Zetland and to reimburse bakers individually for the costs incurred.

The rate is increased to 10s. 7½d. from March 16, 1952, to take account of increases in the wholesale discount rate and in the price of petrol.

From May 11, 1952, the subsidy is increased by a further 2s. 2d. per sack to take account of the changes in the prices of flour and bread on March 16, 1952, thus bringing the rate of subsidy up to 12s. 9½d. per sack from May 11 until further notice.

Provision has been made on Subsidy Claim Form B.S. 83 for a payment on account in respect of the above increases during the period December 2, 1951, to June 14, 1952. Supplementary Claim Form B.S. 83a will provide for the balance and for the payment of the increase in the basic rate from November 4 to December 1, 1951. Current payments from June 15, 1952, will be made on Subsidy Claim Form B.S. 84.

The rates are provisional from April 13, 1952, pending the next review based on costings in April, 1952.

Information and Advice

This Service is available for subscribers to FOOD MANUFACTURE. Postal replies will be sent if a stamped, addressed envelope is enclosed with enquiries.

Synthetic Cream

B.5884. *In the manufacture of synthetic cream, we find the whipping volume much lower than in pure cream and more difficult to whip. Can you suggest any way of overcoming this difficulty?* (N. Ireland.)

The whipping property of synthetic cream depends largely on the stability and "tightness" of the emulsion. Generally, a synthetic cream contains fat and water, emulsified by means of a suitable edible emulsifying agent, and flavouring and colouring added as incidentals.

To obtain good whipping properties, not only must the emulsifying agent give a good, stable emulsion, but a stabiliser is necessary, dissolved usually in the aqueous phase. The stabiliser should be dissolved in the water to make a ½ to 1 per cent. solution; the other water-soluble ingredients should also be dissolved in this solution and the whole aqueous mixture should then be added to the melted fat in which is dissolved the oil-soluble ingredients. Both aqueous and oil phase should be at the same temperature.

The emulsifying agent needed will be about 1 per cent. of the total and it will be found advantageous to use ½ to 1 per cent. of sugar and ½ per cent. of salt.

Passion Fruit Spread

B.5879. *Could you suggest a formula for passion fruit spread?* (New Zealand.)

The following formula may be used as a basis for trial:

Eggs	8 lb.
Passion fruit juice or pulp	5 ,,
Sugar	20 ,,
Glucose	26 ,,
Margarine	10 ,,
Water	3 ,,
Citric acid	½ oz.
Salt	1 ,,
Oil of lemon (optional)	1 ,,
Colouring	q.s.

The margarine is melted in a pan. The passion fruit pulp or juice, sugar, and water are slowly mixed in. The glucose, acid, salt, colour, oil of lemon (if used), and the well-whisked eggs are then added, and the temperature of the mixture slowly raised to 180°F., with continuous stirring.

Cake Decorations

B.5903. *Could you please supply us with a formula and method of manufacturing artificial roses and violet petals, using tapioca flakes as a base?* (Kent.)

We give below two formulae for the manufacture of rose and violet petals:

Rose Petals:

Tapioca flakes	28 lb.
Granulated sugar	60 ,,
Otto White Rose	7 drams.
Rose pink colour	7 ,,

Violet Petals:

Tapioca flakes	28 lb.
Granulated sugar	60 ,,
Otto Heliotrope	7 drams.
Heliotrope colour	7 ,,

The colour is dissolved in a little hot water and filtered. This colour solution and the otto are added to three pints of gum arabic-sugar syrup (50-50) mixture, the sugar previously having been dissolved in water to produce a 32° Baumé syrup, and a sufficient quantity of gum arabic mucilage having been prepared by dissolving gum arabic in water at the rate of 8 lb. gum to 1 gal. water.

The tapioca flakes are placed in a cold dragée pan, and the coloured syrup slowly added to cover the flakes as evenly as possible. A liberal charge of sugar is added and the goods allowed to run until dry. The process is repeated until the flakes are well encrusted with the sugar, when they are taken from the pan and placed in the drying room. They are inspected for bad shapes when dry.

Sage and Onion Stuffing

B.5911. *Could you give us a formula for the manufacture of sage and onion stuffing as sold in packets?* (Lancs.)

The following will form a basis for experiment:

Fine white rusk	10 lb.
Peeled onion	4 ,,
Finely rubbed sage	2 ,,
Dairy salt	8 oz.

The onion is sliced and dried thoroughly prior to mixing with the other ingredients. It is possible to purchase kibbled onion ready prepared which obviates the drying procedure. Dried onion powder might be used.

Information Supplied

The Enquiry Service has dealt with requests for the names of manufacturers and suppliers of plant, machinery, and materials, and also general information as follows:

B.5873. *Dog biscuits.* (N. Ireland.)
B.5877. *Suction device for peas.* (N. Ireland.)
B.5880. *Chewing gum.* (London.)
B.5881. *Dried whole egg.* (London.)
B.5883. *Steam cooking potatoes.* (London.)
B.5886. *Synthetic cream.* (London.)
B.5887. *Dehydration of plums.* (London.)
B.5889. *Baked beans in tomato sauce.* (London.)
B.5891. *Confectionery plant.* (Norfolk.)
B.5892. *Mixing equipment.* (Denmark.)
B.5893. *Vegetable dehydration.* (Ches.)
B.5894. *Dry whey powder.* (Lancs.)
B.5905. *Sugar for bees.* (Cambs.)
B.5906. *Filtration of well water.* (Belgium.)
B.5907. *Chocolate couverture.* (Ireland.)
B.5908. *Ice cream wafer irons, grain cutters, small bushel weight tester.* (Notts.)
B.5909. *Tying machine.* (Wilts.)
B.5910. *Bacon smoking.* (London.)
B.5912. *Brines for curing pork and beef.* (Lancs.)
B.5914. *Candy floss plant.* (London.)
B.5915. *Paper snack box.* (N. Ireland.)
B.5916. *Pasteurisation of liquid whole eggs.* (Italy.)
B.5918. *Bubble gum.* (London.)
B.5919. *Electric travelling hoists.* (Lincs.)
B.5923. *Processing bones and edible offal.* (Ireland.)
B.5924. *Fruit syrups.* (London.)
B.5926. *Liqueur chocolates.* (Middx.)
B.5927. *Sago pearl.* (Lancs.)

Recent Patents

677,123. PALSER, J.: Burners for gas cookers and the like.
677,131. MOLINS MACHINE CO., LTD., and BEST, C.: Weighing machines.
677,137. PULLMAN (PATENT) PRODUCTS, LTD.: Sealed closing means for containers.
677,183. BRITISH CELLOPHANE, LTD.: Production of moisture-proof film.
677,208. CELANESE CORPORATION OF AMERICA: Mixing apparatus.
677,212. SVENSKA AKTIEBOLAGET POLVA: Method of producing bottles and the like from plastic materials.
677,307. BRITISH THOMSON - HOUSTON CO., LTD.: Freezing trays.
677,322. READ, LTD., H., and READ, A.: Manufacture of pasties.
677,330. MERZ, V.: Process for the recovery of sugar cane wax.
677,336. WEISS, A., and MUSIC, L.: Closures for bottles and the like.
677,337. BAKERY AND CONFECTIONERY PRODUCTS, LTD., and OWEN, J. W.: Sheet baking tins.
677,401. FARMER, E. H.: Filler necks or spouts for liquid containers.
677,415. CROWN CORK AND SEAL CO., INC.: Filling heads for beverage filling machines.
677,417. HEMMINGS PTY., LTD., A. V.: Milking machines.
677,427. RADCLIFFE AND CO., LTD., H., and RADCLIFFE, H.: Hinged lids for pan-like containers.
677,440. MANTA PRODUCTIONS, LTD., and WALDEN, N.: Lids or covers for jars, cans, or canisters and like vessels or containers.
677,454. WRIGHT HARGREAVES ENGINEERING CO., LTD., and HARGREAVES, A.: Machine for loosening milk can and other like container lids.

Abstract of a Recent Specification

Sugar Recovery Process

This invention relates to the production of sugar or sugar syrups from sugar-bearing solutions. More particularly, the invention relates to the production of sugar or sugar syrups from molasses or other sugar solutions which are amenable to the Steffen process.

It provides a process for the purification of sugar solution prepared from calcium saccharate which is produced by Steffenising a sugar-bearing solution, which comprises subjecting the resultant sugar solution to the sequential action of cation exchange material operating in the hydrogen cycle and acid-adsorbing anion exchange material.

The problems occasioned by the presence of impurities have been overcome, to some extent, by subjecting the original dilute sugar solutions containing the impurities to the action of ion exchange resins. This is usually achieved by treating the impure sugar solutions sequentially with cation and anion exchange resins. It has been established that a majority of the impurities may be removed from the raw sugar solutions by this method. This is especially true in the case of the inorganic impurities which are inherently present in such solutions; for example, salts of sodium, potassium, magnesium, and calcium. These salts are normally present in the form of sulphates, chlorides, carbonates, and phosphates. Occasionally some ammonium salts may also be present.

It has also been found that these exchange materials will adsorb a certain amount of organic impurities; for example, betaine, glutamic acid, choline, leucine, glutamin, and certain dibasic acids which are also present in raw sugar solutions. The efficiency of the exchange materials, in so far as the adsorption of the afore-mentioned organic impurities is concerned, is not nearly as great as in the case of the inorganic impurities. This is due to the fact that the inorganic ions are preferentially adsorbed on the exchange materials, thereby desorbing the organic impurities which pass into the sugar-containing effluent.
661,190. *International Minerals and Chemicals Corporation.*

Trade Marks

COCETTE.—699,751. Preparations wholly or principally of chocolate for coating foodstuffs. **Blue Arrow Products, Limited,** Towers Factory, Commonside East, Mitcham, Surrey; Manufacturers and Merchants.
LIXLOLL.—703,935. Lollipops being iced confectionery. **M.K.G. Creameries, Limited,** East Street, Bridgtown, Cannock, Staffordshire; Manufacturers and Merchants.
GOLDEN BOY.—704,625. Meat, fish, poultry, and game, all being canned or preserved; meat and fish pastes, preserved and cooked fruits and vegetables, jellies (for food), jams, and pickles. **Edward Proper and Jack Toby Barnett,** trading as **Barnett Trading Company,** St. Magnus House, Monument Street, London, E.C.3; General Produce Merchants.
NO-BO.—705,387. Substances for deodorising beverages and foodstuffs. **Frank Newcombe Shields,** trading as **W. Ryder and Company,** St. Andrew's Works, Bradford, Yorkshire; Manufacturer.
REGAL.—705,419. Refrigerators, and cabinets for storing articles in a refrigerated or cold condition. **B. Jaquiss and Sons, Limited,** Regal Works, Gorton Road, Manchester, 12; Manufacturers.
CRACKLUNS.—705,606. Cooked foods not including biscuits. **Painter Pure Foods, Limited,** 125, High Holborn, London, W.C.1; Manufacturers and Merchants.
RED QUEEN.—705,638. Biscuits (other than biscuits for animals). **Powell's Biscuits, Limited,** 75, Moor Lane, Preston; Manufacturers.
SEALOPAX.—705,646. Paper for wrapping and packaging purposes. **Bunzl Pulp and Paper, Limited,** 70, Finsbury Pavement, London, E.C.2; Paper Merchants.
TETRA PAK.—705,710. Machines for making, filling, and sealing containers, and parts of such machines. **Tetra Pak Company, Limited** (a Joint Stock Company organised under the laws of Canada), Dominion Bank Building, 68, Yonge Street, Toronto, 1, Canada; Manufacturers.
TEATEX.—705,880. Tablets containing tea for use in making the beverage. **George Wright Taylor,** 60, Leeds Road, Bradford, Yorkshire; Manufacturer and Merchant.
CHANTECLERS. — 706,267. Chocolate covered confections having liquid centres. **Old Chelsea Liqueurs, Limited,** 19 and 21, Speke Road, Battersea, London, S.W.11; Manufacturers.

Recent patents and trade marks have been selected from the "Official Journal of Patents" and the "Official Trade Marks Journal" and are published by permission of the Controller of H.M.S.O.

New Companies

Beattie Brothers (Exports), Limited. (507913.) 106, Fenchurch Street, London, E.C.3. To carry on business of importers, exporters, buyers, sellers, and manufacturers of and dealers in merchandise, foodstuffs, provisions, and produce, etc. Nom. cap.: £5,000 in £1 shares. Dirs.: M. P. Beattie, Mill House, Rowfant, Sussex (permt.); A. M. G. Beattie, Orchard Cottage, Ifield Sussex; and C. N. Beattie, Ley Lodge, Worth, Crawley, Sussex.

Dowlings (Golders Green), Limited. (507918.) 61, Portland Place, London, W.1. To carry on business of manufacturers of and dealers in chocolate, boiled and other sweets, biscuits, nuts, etc. Nom. cap.: £1,000 in £1 shares. Dirs.: H. Salomon and Florence Salomon, 279d, Finchley Road, London, N.W.3.

Billian Confectionery Company, Limited. (508125.) Maltravers Street, Sheffield, 4. To take over business carried on as "The Billian Confectionery Company" at Sheffield, buyers and distributors of nuts and raisins, etc. Nom. cap.: £3,000 in £1 shares. Permt. dirs.: D. I. Robertson, 17, Southgrove Road, Sheffield, 10, and D. Robertson, 433, Hastilar Road South, Sheffield.

Primary Food Machines, Limited. (508147.) Abbott's Chambers, 202, Bishopsgate, London, E.C.2. To carry on business of mechanical engineers, iron-founders, manufacturers of and dealers in milling machines and equipment, bakers' ovens, etc. Nom. cap.: £100 in £1 shares. Dirs.: W. Gilbert, 10, Fairfield Road, Croydon; R. W. Gilbert, 65, Croham Road, South Croydon; G. R. Gilbert, and W. F. Gabbott.

Frost's Vitamints, Limited. (508207.) To carry on business of manufacturers of and dealers in confectionery, chocolates, sweets, and ices, and cooked and prepared foods, etc. Nom. cap.: £100 in £1 shares. Dirs.: to be appointed by subs. Subs.: J. H. Hussey, 87, Woodfield Drive, Gidea Park (clerk), and W. F. Parcell, 36, Silverthorn Gardens, N. Chingford, London, E.4 (clerk).

A. Hanks, Limited. (508338.) 89, Muntz Street, Birmingham, 10. To carry on business of manufacturers of and dealers in domestic, household, and general electric and other equipment, including washing machines, refrigerators, etc. Nom. cap.: £500 in £1 shares. Dirs.: A. Hanks, Mary Hanks, and A. Hanks, Jr., all of 89, Muntz Street, Birmingham, 10.

Peters Pies, Limited. (508443.) 105, Kingswell Road, Bournemouth. To carry on business of milk purveyors, dairymen, pork pie and sausage manufacturers and merchants, etc. Nom. cap.: £100 in £1 shares. Dirs.: J. W. Wardell, Bay Cottage, Dorset Lake Avenue, Lilliput, Dorset; P. S. Hallifax, 105, Kingswell Road, Bournemouth.

Sid Simmonds and Company, Limited. (508668.) 5, Mill Street, Kidderminster, Worcs. To take over business of meat and poultry purveyors, manufacturers of cooked and *à la mode* meats, and haulage contractors carried on as "Sid Simmonds" at Kidderminster and Stourport. Nom. cap.: £10,000 in £1 shares. Dirs.: S. Simmonds (permt. dir. and ch.), Redcar, 445, Stourport Road, Kidderminster; Mrs. M. M. Best, Beverley, 11, Franche Road, Kidderminster.

From Jordan and Sons, Limited, Company Registration Agents, 116, Chancery Lane, London, W.C.2.